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Mercantilism and Modern Growth

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Nations close themselves voluntarily to varying degrees. Restrictions on the flow of ideas are difficult to understand, since open countries have higher relative incomes. This article provides an explanation based on the existence of two channels of public finance—traditional and mercantilistic. The latter refers to monopoly creation to provide a stream of government revenue. Strong, profitable monopolies require that the nation be closed to new ideas about technology and organization. The government sets the degree of restriction to balance current mercantilistic revenue with future revenue from traditional sources. The model is supported with numerical simulations and historical illustrations.

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> *To be precise [Colbert's mercantile policy] was literally a kind of indirect taxation, taxing the consumers through the monopolistic artisans. . . . Industrial control thus stood revealed as naked fiscalism. (Eli Heckscher, 1935, pp. 180–182)*
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> *Mercantilism had six aspects, not five: the sixth was public (or royal) finance, and one might with great cogency maintain that it was the most important of the lot. (C. Herbert Heaton, 1937)*
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> *In the interpretation developed here, the supply and demand for monopoly rights through the machinery of the state is the essence of mercantilism. . . . the state found it efficient to seek revenues by selling monopoly and cartel (guild) privileges. (Mercantilism, conceived as a broad process of economic regulation, seems to be a perennial state of most societies (Robert Ekelund and Robert Tollison, 1981, pp. 5–6, 153)*

1. Introduction

Postwar economic data allows us to make two general observations. First, the *distribution* of world per capita income relative to the world leader has shown little convergence, although it has not been completely stable. Second, openness appears to have a positive effect in raising an *individual nation's* per capita income. Both propositions have found support in a variety of empirical studies.[1] In addition, note that openness is an *absolute*, not a relative, measure. That is, it is possible for a country to be perfectly open or perfectly closed. From this property it follows that a general shift to the right in openness would also entail a

degeneration of its global distribution, as nations became crowded at the high end. An important implication of all this is the following: if the world's countries as a group had become increasingly open in the last decades, we would have seen more than very meager convergence in the distribution of per capita relative income. Openness appears to have been limited and resisted by many countries. Why is a policy that can confer important and long-lasting benefits rejected so often?

The answer that I develop in this article begins with the observation that throughout history governments have had two sources of revenue, a *traditional* source and a *mercantilistic* source. By the former I mean the direct taxation of households; by the latter, I mean an indirect process of taxing households *through* monopolies. By establishing a monopoly the monarch (or modern government) can create a single large stream of revenue that is much easier to tax than the several small streams of the individual households. To the extent that the government does rely on the mercantilistic tax source, it is in its interest to close the economy—though rarely completely—to new ideas, technologies, and business organizations in order to protect the monopolies' revenue flow. An inevitable consequence of granting a monopoly right is the denial of rights to competitors, those in the best position to advance the state of technical knowledge and general skill.

Mercantilism, as a theoretical system, has been impossible to define.[2] It becomes more intelligible as a system of fiscal expediency by which the government and certain favored organizations jointly extract income from the population. This view has been carefully articulated and illustrated by Ekelund and Tollison (1981), but traces of the argument go back quite far.[3] It is not hard to find evidence (see Section 5) that a principal (but not exclusive) way to generate revenue was by creating and nurturing monopolies that would then cede a portion of their revenue to the government. Actual transfers to the state were made in many ways, often through "loans" that were never repaid, at times as bribes, sometimes as dividends, sometimes as taxes. Once granted privileges, monopolies had a substantial interest in limiting the spread of new knowledge about production and organization to their competitors. The guild system, for example, was famous for slowing the development of new techniques and stopping their use once they became known.

Stagnation, however, is not inevitable. Some countries have opened their economies and reaped the benefits of growth in knowledge. Given the strength of the underlying mercantilistic forces, I identify two secular processes that determine the degree to which the government opens its economy. First, growth in human capital—the very essence of development—encourages the government to *reduce* openness and increase its reliance on monopolies, since greater knowledge raises labor productivity. Second, however, development raises the traditional average tax rate, which leads the government to increase openness and partly reject monopoly collaboration. The balance of these forces determines the country's place in the global distribution of income.

Cycles in openness are possible in the model because I assume that government can choose policy only at discrete times. This constraint raises the possibility that the state will find itself in an unpalatable position in which its best option is to become extremely closed. As a result, income falls considerably. But a consequence of the decline is that at its next opportunity, it selects a far more open policy. Such cycles are typical in the developing world (Krueger, 1993).

The model of this article relies on recent theoretical work highlighting the role of knowledge flows in raising growth or relative income. Rivera-Batiz and Romer (1991) compare the growth rates of two economies when they were either completely separate of fully integrated. In the latter case, diffusion could be said to be instantaneous, and growth rises due to scale economies in ideas in generating knowledge. In Parente and Prescott (1994) the focus is on the barriers placed in the way of technological information from abroad. By slowing diffusion, hindering the ability to accumulate technical and general knowledge, growth is reduced.[4] The basic model here emphasizes technological receptivity in the manner of Goodfriend and McDermott (1999). In contrast to previous work, however, the parameter that governs the flow of knowledge here is endogenously determined by the government.

Douglass North (1981, chap. 2) saw the tradeoff between public revenue and efficient property rights as central to the theory of the state. Although he did not present a formal model of this tradeoff, he saw that a "ruler therefore frequently found it in his interest to grant a monopoly rather than property rights which would lead to more competitive conditions" (p. 28). The theoretical structure presented below can be looked on as one way to formalize North's ideas. Robinson (1997) is also concerned with the reasons that governments might voluntarily restrict growth. In his theory, an autocrat might refuse to provide infrastructure to make it more difficult for the political opposition to mobilize against him. Rosenthal (1998) and North and Weingast (1989) explain the fiscal problems of seventeenth-century France and England in the context of the key constitutional conflict between the crown and the aristocracy. The latter emphasizes a point that I make here: that monopoly is a terrible way to raise revenue; it is extremely detrimental for growth. Finally, Parente and Prescott (1998) construct a general-equilibrium model to explain why monopoly rights persist once granted and use numerical methods to estimate the size of the negative effect. The size of their effect—monopoly can reduce per capita income to a third of its free-market level—is consistent with the estimates I get below. They do not, however, introduce a fiscal motive for granting the rights in the first place nor do they consider growth explicitly.

The next two sections set up the basic model and derive the households' equilibrium paths for work and knowledge accumulation. Section 4 describes the nature of the government's tax collection process. There I define precisely what is meant by traditional and mercantilistic revenue generation. Section 5 is historical, presenting evidence of mercantile finance in the past and suggesting why it is still present today. Section 6 derives the main results using numerical simulations. A final section offers a brief summary of those results.

2. Production and Accumulation

In this section, I build a simple model with the following properties: (1) in long-run equilibrium all countries grow at the same rate; (2) in long-run equilibrium the distribution of world income depends on the distribution of country openness to world technological ideas.

The world consists of many small countries. In country i, per capita output is given by

$$y^i = \Omega h^i e_W^i, \tag{1}$$

where e_W is the fraction of effort that the representative individual of the country devotes to working, h is the country-specific general knowledge that each possesses, and Ω is a factor that applies to all countries in the world. The variable is Ω as a measure of *world technology* (Parente and Prescott, 1994), which either has been accumulated as a result of R&D investment made throughout history (Romer, 1990; Charles Jones, 1995), has arisen as a spillover from global specialization in production (Goodfriend and McDermott, 1995), was generated by learning by doing (Young, 1993; Lucas, 1993), or was created from pure increases in scale via population growth (Michael Kremer, 1993). World technology grows exogenously. Although it is difficult to be precise about a measure of disembodied productivity, I think of Ω as a stock of technical ideas that are available costlessly to producers all over the world.

In addition to having access to world technology, individuals within each country possess a stock of *general knowledge* or human capital h that each person accumulates by the application of effort to learning. It has long been recognized that technical ideas are not put to use everywhere to the same extent. One reason for this may be that the general knowledge level h is so different across countries (Nelson and Phelps, 1966). Many techniques of production could be used in developing nations if the general level of knowledge were higher.[5] This effect is captured in (1). General knowledge or human capital within a country makes the world technology immediately more useful in producing goods.

Within any country, human capital arises according to the following:

$$\dot{h} = h^{1-\gamma}(\kappa\Omega)^{\gamma} e_L . \tag{2}$$

In this expression, e_L is the fraction of effort spent learning. The country-specific κ lies between 0 and 1($0 < \kappa \leq 1$). This formulation captures the idea that there is a *spillover* from the state of world technology Ω to the creation of domestic human capital: people acquire general knowledge more readily the more sophisticated is the production process they use. The variable κ, which we call *familiarity*, was first introduced by Goodfriend and McDermott (1998) and measures the degree to which the country has become open to, or familiar with, the outside world in the sense of *ideas*, not physical commodities. Familiarity measures the effectiveness of the spillover from the technology embodied in world production in heightening individual learning productivity. A country is "perfectly familiar" with the rest of the world if $\kappa = 1$. If, on the other hand, $\kappa = 0$, then the economy is absolutely closed and learning does not take place. The parameter γ (where $0 < \gamma < 1$) measures the intensity of the technological spillover relative to the own-knowledge effect. Finally, we assume that human capital does not depreciate and that it is not costly to educate new family members to provide them with the current level of knowledge.[6]

According to this technology, human capital grows at the rate

$$\frac{\dot{h}}{h} \equiv g_h - \frac{\kappa^{\gamma}}{F} e_L , \tag{3}$$

where

$$F \equiv \left(\frac{h}{\Omega}\right)^{\gamma} . \tag{4}$$

The variable F—which is the principal state variable in the analysis to follow—measures human capital per unit of world technology.

3. Household Equilibrium

Households do not keep all of their earned income; as explained in the next section, a fraction of income is transferred to the government and its agents. I assume that tax rates are flat, so consumption is

$$c = \omega h e_W, \tag{5}$$

where $\omega < \Omega$. The expression for ω, derived in the next section, is considered exogenous by the households.

The household decision-maker maximizes the discounted value of the utility of each family member:

$$J = \int_0^\infty ln\, c(t) e^{-\rho t} dt, \tag{6}$$

where ρ is the household rate of time preference. Instantaneous utility is logarithmic and family size does not influence utility. The maximization is subject to the motion equation (3) and the effort constraint:

$$1 = e_W + e_L. \tag{7}$$

For the allocation of work effort to be optimal it is necessary (see the appendix) that

$$e_W = \frac{F}{x\kappa^\gamma}, \tag{8}$$

where $x \equiv q_h h$ and F is given in (4). The new variable x is the utility value of human capital (q_h is the shadow price). From the constraint (7), learning is given by

$$e_L = 1 - \frac{F}{x\kappa^\gamma}. \tag{9}$$

Optimality also requires that x move through time to satisfy

$$\frac{\dot{x}}{x} = \rho + \frac{\gamma\kappa^\gamma}{F} - \frac{1+\gamma}{x}. \tag{10}$$

Using (3), (4), and (9), we see that F grows according to

$$\frac{\dot{F}}{F} = \gamma\left(\frac{\kappa^\gamma}{F} - \frac{1}{x} - g_\Omega\right), \tag{11}$$

where g_Ω is the exogenous rate of growth of Ω. Finally, all candidate paths of F and x must converge to constants.

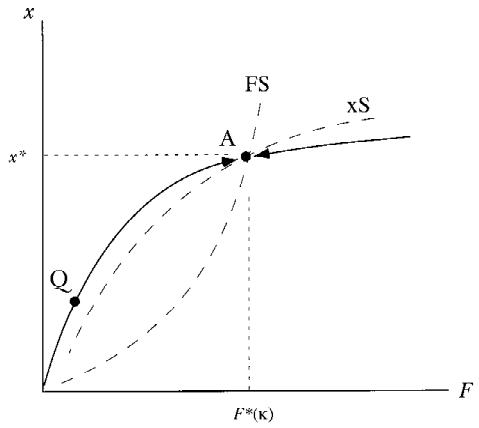

Figure 1. Household path to the steady state.

A solution to this problem has the form of an initial value for x, set by the representative household. Since the initial value of F is given, the motion equations above trace out the entire future progress of both variables. There is a unique value for x_0 that causes the (x, F) pair to converge to the steady state.

To find the steady-state values, set the motion equations (10) and (11) to zero and solve

$$x^* = \frac{1}{\rho + \gamma g_\Omega}, \tag{12}$$

$$F^* = \frac{\kappa^\gamma}{\rho + (1+\gamma) g_\Omega}. \tag{13}$$

All countries approach the same value of x (it is assumed that ρ and γ are the same worldwide) but the long-run F depends on the nation's familiarity, κ. The steady-state pair is shown as point A in Figure 1. The effort allocations in equilibrium can then be found from (8) and (9). Since F is constant in the steady state, it must be true by (4) that h grows at the same rate as Ω : $g_h = g_\Omega$. Per capita product y, as given by (1), will grow at the sum of the rates of growth of h and the global productivity factor Ω, since work effort e_W is constant:

$$g_y = g_h + g_\Omega = 2g_\Omega. \tag{14}$$

All countries grow at the same rate in the steady state determined by the pace of exogenous technical change in the world. It is not true, however, that the steady-state y is the same everywhere. The equilibrium value of a nation's general knowledge h is proportionally greater the larger is κ. This follows directly from the definition of F in (4) and the fact that F^* is proportional to κ^γ. Let y^L stand for the per capita product of the lead country (with the maximum familiarity of 1), use (4) to eliminate h^i in (1), and note that in equilibrium e_W

Table 1. Steady state.

Parameter	Equilibrium	Value
ρ		0.04
$g_\Omega = g_h$		0.01
γ		0.20
	g_y	0.02
	e_L	0.19
	F^*/κ^γ	19.23
	κ^γ/F^*	0.052

attains a common value across countries. From (13) it then follows that a nation's relative income is given by

$$\frac{y}{y^L} = \kappa. \tag{15}$$

Familiarity κ actually shows how far away a nation is from the world leader in terms of per capita income. A country can catch up to world leaders only by raising κ.

Table 1 provides a numerical example of the steady state. The first column lists parameters; the second shows endogenous variables. Growth in real output and consumption per capita is 2.0 percent, people devote 19 percent of their effort to learning, and the productivity of learning time, κ^γ/F^*, is 5.2 percent. None of these are affected by familiarity in the long-run equilibrium.

In general, the initial value of F will not be at its steady-state level. Since κ is fixed, Ω is growing exogenously, and h changes only slowly through the accumulation of knowledge, there will usually be a path of transitional growth in F before the long-run equilibrium is achieved. The differential equations (10) and (11) define a saddle-point equilibrium so that if F begins below its long-run level, it will slowly rise to it: countries grow faster than the world average if they begin with initial stocks of F that are below F^*. The saddle-path is shown as QA in Figure 1. Each country converges to the value of F determined by its own particular κ, which means that each approaches a different per capita product path as illustrated below in Figure 2.

4. Mercantilism, Monopoly, and Government Finance

We now turn to the central question: why don't governments simply open up their countries by setting $\kappa = 1$? Such a strategy, as is clear from (15), would maximize per capita income in the long run and allow the nation to grow fast enough in the short run to catch up to world leaders.

We cannot ignore the fact that, in some cases, familiarity is extremely costly to raise. Geographic isolation may leave a legacy that makes integration into the world economy difficult even after many centuries. The linguistic development of China, for example, continues to inhibit the flow of information to and from the West. Low familiarity that arises from such deep-seated causes is difficult to change. Yet I would argue that in most cases

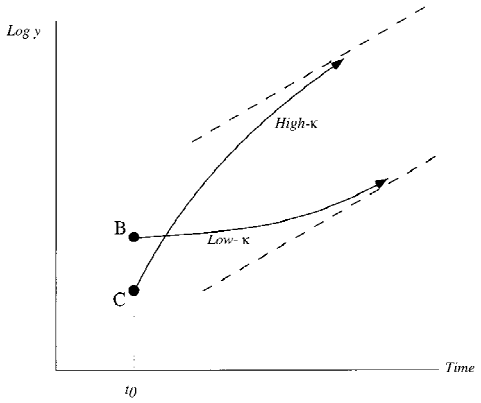

Figure 2. Income paths and familiarity.

familiarity could be raised at little cost simply by removing various "barriers to technological absorption" (Parente and Prescott, 1994) and allowing more freedom to interact with the rest of the world. If so, then it must be true that low familiarity is sometimes a rational strategy. One possibility is that closed economies occur where the traditional source of government finance is weak. This forces the government, first, to create monopolies to generate a stream of revenue and, second, to protect these organizations by reducing familiarity. They erect barriers to the flow of information in order to ensure that the monopolies are financially healthy.

To bring the argument into focus, I assume that the government is concerned *only* about its revenue and uses it essentially for consumption purposes. It is neither transferred back to the households nor used in public good provision that would increase output and tax revenues. Either feature could be built into the model, but since it would obscure the main point, I choose to ignore both possibilities.[7] Given that revenue generation is the key element, I now proceed to develop the three strands of the argument.

First, an outstanding feature of poor countries, both in the present and in the past, is the relatively small size of the middle class. Without a large middle class, traditional taxation is difficult. On the one hand, the rich are adept at hiding income and moving it out of the jurisdiction of the national government, making the effective cost of collection very high. On the other hand, poverty itself limits the average rate of taxation. Very little tax revenue can be generated by traditional methods from that portion of the population that is poor. Below a certain income level, any taxation is inconsistent with survival, but even above that, the cost of monitoring and collection may be high enough to prohibit any meaningful revenue generation. To these reasons, we may add a historical one. In certain eras, revenue collection by national governments was made extremely difficult by the claims of local jurisdictions, both towns and feudal political structures. For these reasons, I assume that the tax rate is largely exogenous. It rises with the level of development, but it cannot be changed by the government.[8]

Second, through the ages governments have dealt with obstacles to revenue generation in different ways, including the debasing of the coinage, the use of tax farmers, and modern inflationary finance. I am going to focus on one particular method: chartering a monopoly to extract revenue from its profits. We know that governments explicitly granted monopoly rights during the mercantile era, and we observe many measures today that have a similar effect, although they are seldom so obvious as before. I hypothesize that these rights were granted solely to create a stream of revenue that could be easily taxed. This does not necessarily mean that the ill consequences of monopoly creation were ignored, only that such effects were outweighed, in the mind of the sovereign, by the increase in revenue.

Third, if the mercantilistic source of revenue is important to the government, then we should expect to see low familiarity, since monopolies are most healthy and profitable when the country is closed to competition in both goods and ideas from the outside world. In other words, it is necessary for the government to place barriers in the path of competitors, both in terms of imports of commodities and of ideas, so that they do not challenge the position of the monopolist. These restrictions translate into a low κ, making learning costly and keeping relative income low in the steady state (see (15)).

These ideas can be formalized as follows. First, assume that the monopolies succeed in extracting a fraction $s = \sigma(1 - \kappa)$ of household income y, where σ is a positive constant. With this formulation, the more open a country, the smaller the transfer from household to monopolist. The maximum transfer σ occurs when the country is completely closed ($\kappa = 0$).[9] From what remains of household income, the government taxes at the *traditional tax rate* τ, which is assumed to be constant. After both kinds of revenue extraction, per capita consumption is

$$c = (1 - \tau)(1 - s)y = \omega h e_W, \tag{16}$$

where $\omega \equiv (1 - \tau)(1 - s)\Omega$ was used in the previous section in the household decision problem. Taxes are not allowed to reduce the level of income but merely to redirect it. This is a simplification that I justify on two grounds: because it keeps the analysis focused on the question of openness, and because I have introduced an offsetting simplification in the form of not allowing the revenue collected by the government to be spent on public goods to raise income.

Monopolies earn gross revenues of

$$R_M = s\, y\, N = \sigma(1 - \kappa) y\, N, \tag{17}$$

where N is total population in the country. The government taxes the monopolists' gross receipts at the rate $m + \tau$, where $m > 0$ is called the *mercantilistic tax premium*. That is, the government can tax the monopolies at a higher rate than it can tax the households.[10] This source of revenue, $(m + \tau)R_M$, added to the revenue obtained directly from households—which is $\tau(1 - s)y\, N$—yields total receipts to the government of

$$R = [\tau + m\sigma(1 - \kappa)]yN. \tag{18}$$

Monopolies are valuable to the government because the income that they divert from households is taxed at a greater rate than it could be if it remained with the households.

5. Mercantilism: Past and Present

There can be little doubt that in the centuries before the industrial revolution a significant portion of government revenue in Europe came from the granting of monopoly rights. According to Ekelund and Tollison (1981, p. 6),

> The state found it efficient to seek revenues by selling monopoly and cartel (guild) privileges. Such revenues supplemented the tax revenues available to the English and French monarchs, and indeed the degree of dependence on revenues from monopolization was very significant in mercantile England and France. During the administration of Colbert (1662–1683), for example, the French state procured roughly one-half of its yearly revenues from the granting of monopoly and cartel rights.

If this quote is believable, mercantilistic finance was clearly important in the seventeenth century. This method of generating public revenues, however, was understood as far back as ancient Greece, as illustrated by the following (Aristotle, *The Politics*, as quoted by Deans-Smith, 1992): "The way to make money is to get, if you can, a monopoly for yourself. Hence we find states also employing this method when they are short of money: they secure themselves a monopoly."

In this section, I consider various historical and modern examples of mercantilistic finance, and show that these did indeed have a negative effect on technological development. Such a survey necessarily must be brief, and I confine my observations to two general areas: Europe between the fifteenth and nineteenth centuries and less developed countries in our own century.

Under the Hapsburgs and Bourbons, the Spanish empire made extensive use of monopolies to raise revenue in the new world. While the crown monopolized many goods, including mercury, salt, gunpowder, and snow, the tobacco monopoly was by far the most important. At its height in the late eighteenth century, monopoly profit from tobacco constituted nearly a quarter of all revenue generated in New Spain (Mexico). This revenue, moreover, bypassed the regular treasury and went directly to the king (Haring, 1952, p. 305). The monopoly had its own military force to discourage any form of competition, which may account for the near-total lack of technological innovation and consistent problems with quality over the fifty years of its existence (Deans-Smith, 1992, especially chap. 5). Spain also monopolized, or attempted to monopolize, trade with its North American colonies. Until the end of the seventeenth century, the only legal trade was via massive flotillas approved by the Spanish crown and organized by the wealthy commercial houses of Seville and Cadiz. This system generated crown revenues through direct duties and services in kind but exerted an important drag on innovation in the New World. As a noted historian (Haring, 1952, pp. 320–321) states:

> Within a few decades (the *consulado*] became virtually a closed corporation of a few great commercial houses enjoying a monopoly of traffic between Spain and its overseas empire. . . . Through it [the Seville merchants] also made loans and extended other financial aids to the crown, often under duress or to secure special

> favors. . . . It was one of the most serious obstacles to [the colonies'] growth in industry, in population and in general well-being.

The effect on Spain itself was hardly less depressing, and the monopolistic trading policy was part of a general economic and political decline that left the once-powerful country in ruins by the end of the eighteenth century.

Mercantilism reached its zenity, however, with France and England in the seventeenth and eighteenth centuries. Their histories are painstakingly detailed by Heckscher (1935) in his classic book. There he shows how the French monarchy, directed by the power Colbert, actually *strengthened* the medieval guild system, propping up monopoly rights for many professions in exchange for revenue (p. 142, p. 178). In many cases, this revenue took the form of buying back the offices of newly created "inspectors" who had the power of regulation and oversight over the particular craft guild (p. 178). Many times, these offices were sold repeatedly, generating a stream of revenue (p. 180). The quote at the beginning of this article shows that, despite Heckscher's interpretation of mercantilism as a guiding principle along five dimensions, he clearly saw that "fiscalism" (the raising of revenue) was extremely important. Herbert Heaton (1937) went so far as to claim that Heckscher was wrong not to elevate public finance to as lofty position as his other five principles.[11]

It was also clear that the French monarchy actively reduced familiarity to help the monopolistic guilds it supported. The starkest case is that of printed calico cloth. The techniques for making this cloth, which became extremely popular by the end of the seventeenth century, were more advanced in England and India, with the result that the producers of traditional fabrics in France stood in danger of losing considerable profit. As a result, the French monarchy banned the *use* of all such fabrics under severe penalty.[12] This led to total stagnation of this critical line of industrial development and the emigration of many French craftsmen (Heckscher, 1935, pp. 170–174; Ekelund and Tollison, 1981, pp. 93–96). There are many more examples, including gunpowder, salt, and luxury items, where the French monarchy actively supported monopoly and put a damper on technical innovation (Ekelund and Tollison, 1981, pp. 78–80).

Mercantile England, especially before the civil wars in the 1640s, demonstrated similar tendencies with respect to monopoly creation and government revenue generation. Although the crown was never completely fiscally independent in France, it came closer to achieving that ideal than its English counterpart. Parliament had greater power than any French institution to limit the King's revenues, especially after 1688, forcing him to search for alternate sources of income.[13] This conflict gave rise to the large trading companies like the East India Company and the Hudson Bay Company, which owned their exclusive charters to the crown and ended up paying handsomely for them. Although the transfers were made in many ways, the essence of the process was clear (Heckscher, 1935, pp. 439–441, emphasis added):

> To say that the participation of the English kings in the undertakings was confined to attempts at shareholding is to draw rather artificial distinctions. There was no real difference between this kind of participation and the other attempts to force money from the successful companies. Sometimes it was called participation, sometimes loans, occasionally gifts, and sometimes, though rarely, taxes.. . . The system thus involved an indirect taxation of consumers' goods in the financial interests of the

> state. *It was an indirect taxation of consumption by means of a monopoly*, not in the hands of the state but wielded by private individuals.

Whatever the theoretical underpinnings of mercantilism, in practice a very important component was the ability to tax the citizenry in a roundabout way via private, crown-chartered monopolies. In 1621 there were about 700 different monopolies in England, including those for soap, iron, glass, dyes, printed books, and other key goods in fledgling industries (Hill, 1961, pp. 32–34). There can be little doubt that these monopoly organizations exerted a tremendous drag on technological innovation (North and Weingast, 1989), especially considering that even the monopoly patents and charters were insecure, both from acts of a hostile Parliament and from revocation and resale by the king himself (Hill, 1961, p. 35).

Subsidies, especially export bonuses, also played an important role in mercantilist policy of the seventeenth and eighteenth centuries. At first glance, such payments would appear to contradict the hypothesis that mercantilism was essentially a means of filling the treasury. A recent paper by Irwin (1991), however, makes the point that, at least for the East India trade, Dutch managerial contracts acted like subsidy payments, and succeeded in diverting profit away from the English. He also notes that direct subsidies could have been imposed by either side to yield even larger profit—and state revenue—in the long run (pp. 1310–1311). To what extent other export bonuses of that era reflected such strategic trade policy is an important question.

The key question for *modern* growth, however, is this: Does mercantilism still exist? In many developing nations, under one-party rule or managed by huge bureaucracies guided by industrial policies, the answer is undoubtedly, yes. On the other hand, in modern economies, where tax reporting and collection are fairly efficient, mercantilism is much less in evidence. Yet even in the United States, given the undue influence of certain lawmakers, it has been commonplace for industries and corporations to receive favors that enhance their competitive edge over others (some of which reduce familiarity) in return for payments, usually in the form of campaign contributions. A case in point is the ADM Corporation, which has enjoyed a sugar quota and ethanol subsidies that have earned it vast sums over the years. In return, it funnels much smaller amounts into the coffers of various politicians. The Jones Act establishes a monopoly on shipping that is estimated to cost the U.S. economy $2.8 billion; maritime unions gave only $1.8 million to congressional candidates to ensure the continuation of the monopoly (*Wall Street Journal*, 1998). Anther example concerns tobacco in the United States. A good case can be made that the proposed deal was, before its collapse, a simple exchange of legal immunity (a monopoly right) for a stream of revenue. The government was quite open about its need for the revenue that it expected to receive. The familiarity consequences of the tobacco deal may be minor, but one could argue that the decline of ship-building, and the distortions from ethanol in fuels do have negative consequences for technological development.

Governments of poor nations today are vastly more complicated than they were in the seventeenth and eighteenth centuries. Consequently, it is much harder to match any particular mercantilistic policy with the revenue sent to the government. In many cases, such policies are instituted after intense lobbying and accompanied by secret payoffs. In others, there is no overt policy, but corrupt functionaries are able to extract a stream of revenue from firms in exchange for selectively enforcing regulations or bid rigging. These have the

effect of establishing monopoly positions (Shleifer and Vishny, 1993). The result of such practices on familiarity may be large and negative.

Drawing an analogy between monarchies during the mercantile era and dictatorships in the modern era, we might expect that present-day monopoly policies would be most visible in countries ruled by strong men or single parties. Consider, for example, Trujillo in the Dominician Republic, Somoza in Nicaragua, Marcos in the Philippines, and the Duvaliers in Haiti (Robinson, 1997). It is astounding how much of the economy each of the dictators was able to control, usually directly or through close relatives and henchmen. Trujillo owned 60 percent of the land and had claim to over half the gross domestic product of the Dominican Republic; Somoza had perhaps half that in his country. Marcos had monopoly control of several key industries, and the Duvaliers likewise amassed great wealth, not just in the form of Swiss bank accounts but also in the form of ongoing interest in key industries. Needless to say, none of these countries was open to any form of competition that might curtail the profits of the monopolies owned and operated by the rulers. It is also true that their comparative economic performance was dismal: the Philippines fell markedly behind nations it had led just decades before, Nicaragua had the lowest growth rate in Latin America, and per capita income in Haiti actually declined year after year.[14]

Democracies in the developing world tend to cloak mercantile tendencies in the mantle of industrial policy. After World War II, governments of lesser developed countries grew gigantic under the influence of the idea that import substitution would result in fast industrialization and catch-up to world leaders (Bruton, 1998). This process created enormous bureaucracies and severe price distortions and led to an interdependence of private businesses and bureaucratic managers who relied on one another for gain in the form of revenues and political influence (Kruger, 1993). Monopolies came into existence and did in fact generate considerable revenue for privileged license-holders, which translated into revenue and power for the bureaucrats that created and sustained them, and stifled competition and learning (Krueger, 1993, especially chaps. 2, 4, 5). One example is the Informatica market reserve policy of Brazil, begun under the military regime in the late 1970s and phased out in the early 1990s. This law severely restricted both the importation and domestic production of personal computers by foreign firms. When the restrictions began, there were few domestic firms in a position to produce personal computers and peripherals. Charging prices from double to five-fold for two-year-old reverse-engineered technology (Schmitz and Cassiolato, 1992), it is likely that the profits of these firms were exceedingly high. Although more firms entered the market, the initial advantage to the original producers made them in practice a kind of monopoly. The opposition to this law from users of computer technology became increasingly strong throughout the decade, as it became clear that the law kept familiarity low and made it difficult for producers to take advantage of new technologies being developed abroad. What is less clear is the nature of the transfer back to the government as payment for granting the privileged position. Since such payments are generally illegal in modern democracies and thus hidden, it is difficult to form tests of the mercantile hypothesis. Still, until we have evidence to the contrary, it is difficult to believe that the large concessions granted over oil, minerals, and the large state manufacturing and financial enterprises in Brazil, Mexico, Argentina, Turkey, and India, were the result of disinterested bureaucrats uninfluenced by politicians who stood to earn real transfers.[15]

6. Government Policy and κ

Governments face a tradeoff that arises from the existence of two sources of revenue. On the one hand, a low κ is good for monopoly and keeps *current* revenue high. On the other hand, a high κ results in lower immediate revenues but does generate abnormally high short-term growth and a permanently higher path for real income, which raises revenues *in the future*.

The basic nature of the tradeoff facing the government can be understood with reference to Figure 2. Assume that two countries initially possess the same κ and the same h_0, so both begin at point B. Now, let one of them succeed in raising its κ, while the other maintains the original value. The rise in κ would reduce work effort by (8) causing a *reduction* in per capita income y_0. Since people devote more effort to learning, the economy's output falls, reducing government revenue. The low-κ country will eventually converge to the low-y path, while the other country, which suffers an initial decline in y, will converge to the high-y path, generating a high level of tax revenue. Both grow at the same rate in the long run, but the consequences for the government budget are likely to be very different.

If familiarity were easy to change, the best policy for the government would be to follow the time path of κ that maximized the integral of discounted public revenue from the present to the infinite future. This policy would be time-consistent and would induce just the right effort from individuals to produce the proper balance between current and future revenue. There are two problems involved with this approach. First, finding such a path for κ is quite difficult, even with the relatively simple structure of the model of this article. Second, and of greater importance, changing national familiarity is likely to be so difficult politically that it can be done only infrequently. To take one example, Japan's decision to become more open after the Meiji restoration followed centuries of a consistent policy of closure and low κ. In the modern era, Chile became much more open and liberal in the 1970s, but only following a traumatic political upheaval. Argentina reversed decades-long Peronist policies in the 1990s to become more outwardly oriented but did so only after running the economy into the ground and losing a war to England.

To reflect the rigidity in picking familiarity, I assume that the government decides on a *constant* value of κ over a finite *planning horizon* of length T. We may think of the planning horizon as that period over which the government expects to earn the revenue generated by the level of familiarity that it sets. For some societies, like the United States and most of Western Europe, T may be quite long, since the government is greater than the political party that happens to be in power. For other nations, such as Haiti, the planning horizon may be very short, since there is a much stricter identification of government revenue with party income.

Although the government uses T to set κ, I assume that opportunities to change κ may arise before the end of the planning horizon. If such an opportunity occurs, the government picks a new level of familiarity and again bases the decision on the full planning horizon T. By distinguishing between the planning horizon and the more frequent, but random, ability to adjust familiarity, I combine forward-looking behavior with some degree of flexibility.

Let the government select κ to maximize the revenue integral:

$$J = \int_0^T R(t)e^{-\rho_G t}dt, \tag{19}$$

which can be expressed as[16]

$$J(\kappa, V, F_0) = \int_0^T [\tau + m\sigma(1-\kappa)]\,\Omega(t)^2 \frac{F(t, F_0, \kappa)^{1+\frac{1}{\gamma}}}{\kappa^\gamma X(t, F_0, \kappa)} N(t) e^{-\rho_G t} dt. \tag{20}$$

In these expressions, T is exogenously given, V refers to the vector of fiscal parameters—$[\tau, m, \sigma]$—particular to the country in question, ρ_G is the government's discount rate, and F_0 is the initial state faced by households.

The functions $F(t, F_0, \kappa)$ and $X(t, F_0, \kappa)$ refer to the values of F and x along the optimal path QA in Figure 1. I assume that the household discount rate ρ and the learning spillover effect γ are the same across countries, so the paths of F and x differ only to the extent that κ and the initial value F_0 differ.

World technology Ω and the country's population N grow exogenously. Normalizing their initial values to 1 allows us to simplify the revenue integral to

$$J = [\tau + m\sigma(1-\kappa)] \int_0^T \frac{B(t, F_0, \kappa)}{\kappa^\gamma} e^{-rt} dt, \tag{21}$$

where $B(t, F_0, \kappa)$ is the ratio to F to x, and the government's effective rate of discount r is adjusted for the growth in population η and technology: $r \equiv \rho_G - \eta - 2g_\Omega$.

It is not possible to find an analytical solution to the problem of maximizing J, since there is no closed-form expression for the $B(.)$ function. Instead, I use numerical methods that build on the information in Table 1. Using the parameter values given there, it is possible to find a numerical representation of the QA path or *policy function*. Using the policy function and the differential equation for F we can then find numerical approximations for the two functions that form $B(t, F_0, \kappa)$.[17]

6.1. Initial Calibration and Time Consistency

For different values of κ—given the other fiscal variables and the starting endowment F_0—individuals would choose distinct time paths for F and x, generating different values for government revenue in (21). After evaluating the integral numerically for each value of κ, the government then picks the familiarity level that maximizes its total revenue. Even if m or σ were zero, so the government had no interest in setting up monopolies for financial reasons, it might still be in the government's interest to close the economy if the planning horizon T were sufficiently short. The reason can be seen by reference to Figure 2: by reducing κ the government raises current work effort, and thus tax revenue, at the expense of learning effort. If T is small enough, even if $m\sigma = 0$, it may be rational to set $\kappa < 1$ since future tax revenues do not matter. Setting the parameters $\tau = 0.10$, $T = 75$, and $\rho_G = \rho = 0.04$ (which means that $r = 0.005$, once we subtract population growth $\eta = 0.015$ and technology growth $2g_\Omega = 0.02$) avoids this outcome. For those parameter values, if either $m = 0$ or $\sigma = 0$, the government would always set $\kappa = 1$, no matter what the level of F. In other words, in the absence of mercantilistic influence, government policy would be both time-consistent and optimal for the households.

Let the function

$$\kappa = \kappa_G(F; m\sigma, \tau), \tag{22}$$

be the function that relates the fiscal parameters and the state of the economy F to the government's choice of κ.[18] The vertical line at 1 in Figure 3 labeled $\kappa_{G,0}$ shows the value of κ that the government would set, for different values of F, given that $m\sigma = 0$, and $\tau = 0.10$. The fact that it is vertical means that for any level of F, people behave in such a manner that the government finds it rational to keep the economy completely open: $\kappa = 1$. The upward-sloping line labeled $F^*(\kappa)$ in Figure 3 refers to the steady-state level of F as given by (13). The two lines cross at point E, which is the steady state when there is no mercantilism. Assume that the economy began with $F = 1$, so that individual human capital were equal to the level of world technology. In Figure 3 the government places the economy at point D, since we know that with $m\sigma = 0$ the best choice for the government is $\kappa = 1$. With complete openness, F grows over time. Although the government gets opportunities to reoptimize and change κ, it will not do so. The economy will converge directly to point E, and its relative income level eventually will be the equal of the world leader.

Before we deal with mercantilism, it is important to see what would happen if the planning horizon were very short. Numerical methods reveal that when $m\sigma = 0$ the policy problem is of the bang-bang variety: if T is long, $\kappa = 1$ is optimal; if T is short, then it is optimal to set κ at its *minimum* level, which I have set at 0.06. This value was chosen because relative income of 6 percent of the U.S. level reflects the state of some of the world's poorest nations, like Haiti and Bangladesh.[19] It is, therefore, a possibility that some very closed economies are that way not because of mercantilistic influence but because they are controlled by regimes that have little stake in the future of the country. This may be because they belong to certain ethnic groups that will be driven from all power if they lose an election or fail to put down a rebellion.

6.2. Mercantilism and Familiarity: The Baseline Case

Monopolies may be strong enough to make mercantilism worthwhile for the government. As a baseline, assume that the maximum transfer rate is $\sigma = 0.50$, so that if the economy were completely closed ($\kappa = 0$) monopolies could skim half of the household's income before the government took its cut. Further, assume that the mercantilistic premium $m = 0.30$ so the government can earn four times more revenue per dollar by taxing monopolies instead of households. As above, the government planning horizon is $T = 75$ and the traditional tax rate τ is kept at 10 percent. Let the country again begin with both human capital and world technology set to 1, so the initial value of F is also 1: $F_0 = 1$. The average citizen of this country would have a low income, but his effort-productivity for accumulating more human capital, κ^γ/F, would be relatively high. The upper half of Table 2 shows the complete set of fiscal parameters.

For this case, the government revenue integral reaches a maximum for a familiarity value of $\kappa = 0.80$. Complete openness is not in the government's interest. The actual transfer rate

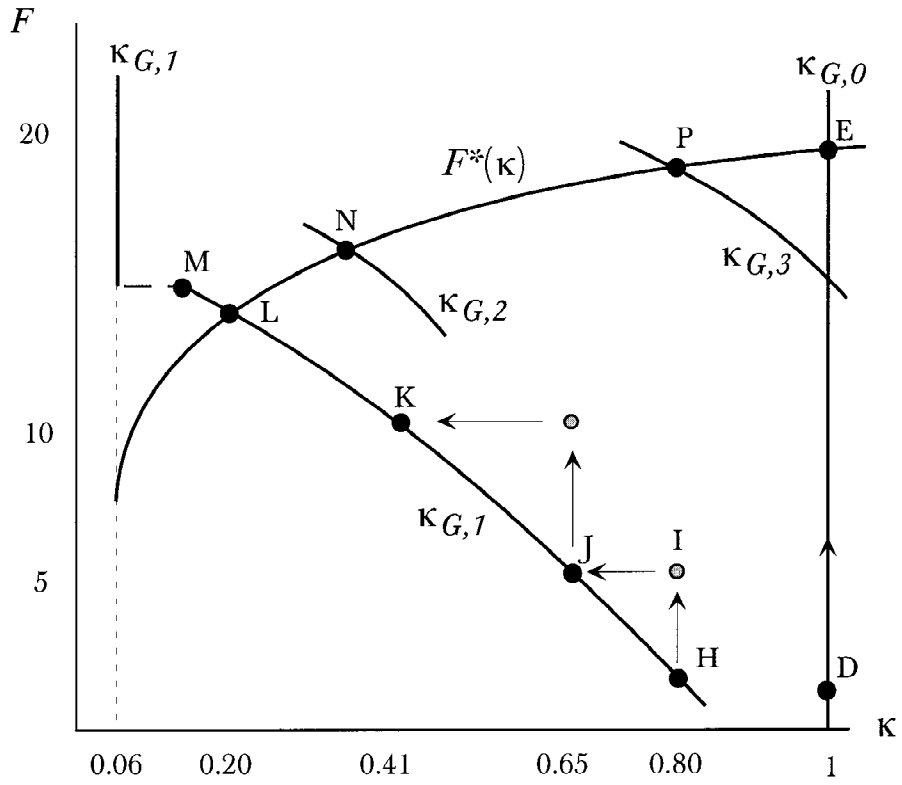

Figure 3. Familiarity dynamics.

to monopolies from household income is $s = \sigma(1-\kappa) = 0.10$, and the fraction of income retained by the household is $(1-\tau)(1-s) = 0.81$. Finally, total discounted consumption over the seventy-five-year planning horizon with κ set to 0.80 is approximately 70 percent of the total consumption that would have been realized with full familiarity ($\kappa = 1$). This is called the "consumption shortfall ratio" in the bottom half of Table 2. In Figure 3, point H corresponds to the initial state in the baseline case. The locus labeled $\kappa_{G,1}$ represents equation (22), the rational familiarity level, for the baseline parameters.

6.3. Familiarity Dynamics

Since F is below its steady state $F^*(\kappa)$ at point H, it will be growing over time. As it grows, the government is presented with randomly timed opportunities to change openness. To take an example, it takes about twenty-three years for F to reach 5 (point I) at which time, let

Table 2. Baseline fiscal parameters and results.

Variable	Symbol	Value
Parameters		
Traditional tax rate	τ	0.1
Mercantilistic tax premium	m	0.3
Maximum monopoly transfer rate	σ	0.5
Government planning horizon	T	75
Government net discount rate	r	0.005
Initial human capital	h_0	1.0
Initial state	F_0	1.0
Results: Initial state		
Familiarity	κ	0.80
Monopoly transfer rate	s	0.10
Income retention share	$(1-\tau)(1-s)$	0.81
Consumption shortfall ratio		0.70
Results: Steady state		
Familiarity	κ	0.20
Monopoly transfer rate	s	0.40
Income retention share	$(1-\tau)(1-s)$	0.54
Consumption shortfall ratio		0.34

us say, the government is presented with the opportunity to pass a new policy with respect to openness. It will actually choose to *reduce* κ to 0.65. This is shown as point J, which lies along the $\kappa_{G,1}$ locus. It may appear counterintuitive that an economy that accumulates more human capital relative to world technology, and thus achieves a greater standard of living, actually finds it in its interest to close itself off to a greater degree from the rest of the world. We must keep in mind, however, that such a policy is instituted not because it is in the citizens' interests but because it is in the interest of the government. It is rational to close the country because the higher F means that extra work—accomplished by reducing κ—yields greater income passing through monopolies and available for taxation.

Human capital continues to rise relative to world technology in spite of the reduced openness, and if the next opportunity to adjust κ occurs when F reaches 10, the government would reduce κ to 0.41. This is shown as point K. The steady state occurs at point L, where $F = 13.88$ and $\kappa = 0.20$. There is, however, no guarantee that the economy will converge to the steady state, since to do so requires that an opportunity to adjust κ arise just exactly when F reaches 13.88. If, as appears likely, F exceeds that level before the government can change familiarity, the resulting downward adjustment in κ would be so large that F would begin to decline. In other words, there may exist a *cycle* in κ around the steady-state L, one of uneven amplitude based on the infrequent, random events that give the government a chance to adjust.[20]

If the steady state were achieved, monopolies would seize a full 40 percent of the income of households that, after the government takes its cut, would retain only 54 percent of what they earned (see Table 2, last section). With familiarity of 0.20, the economy's per capita product would be a *fifth* of that of the world leader. Nations in 1990 with relative per capita income in the range of 15 to 25 percent of the U.S. level include Argentina, Brazil, Columbia, Poland, Thailand, Turkey, and Yugoslavia.[21]

Table 3. Steady-state κ: effects of τ and m.

	m		
τ	.05	.10	.30
.10	.59	.35	.20
.20	1.0	.59	.27
.30	1.0	.82	.35

Cycles generated by governments lacking fine control may demonstrate deep downswings in κ, since there is a discontinuity in the κ_G locus due to the inherent structure of the model. When F gets above point M in Figure 3, for example, the best choice for the government is the minimum level of familiarity.[22] If the country were this closed, accumulation of human capital would be far inferior to the growth in world technology, and F would sink directly. At the next opportunity, the government would raise κ back to the appropriate place along $\kappa_{G,1}$.

The notion that cycles may characterize equilibrium is attractive. The postwar experience of Latin America provides a good example of a region that has lacked consistency with regard to openness. It was closed for several decades and then, in response to stagnating relative incomes, took decisive measures to become more liberal with respect to capital and trade. Chile is at the forefront of the current wave of raising κ, but one could also point to Argentina, Brazil, and Colombia. Others, like Venezuela and Peru, remain quite closed.

6.4. The Importance of Raising the Traditional Tax Rate

Mercantilistic forces lead to closed economies, and the strength of that closure appears to rise with development. But are there any countervailing forces that drive an economy towards openness? The answer is yes: as the traditional tax rate τ rises, the government voluntary raises κ and reduces its reliance on monopolies as a source of public finance. We have good reason, furthermore, for expecting τ to rise with F. The greater is F, the larger is the human capital of the average citizen, and the larger is the middle class. Since a greater fraction of income can be obtained from the middle class than from either the poor or the rich, it is reasonable to assume that τ rises with the state of development.

When τ rises, the κ_G locus shifts to the right. If τ doubled to $\tau = 0.20$, for example, the government would select a familiarity level of 0.27 in the steady state. This is noted in the last column of Table 3. If the tax rate rose to 0.30, which might reasonably considered a maximum, the locus would move to the position marked $\kappa_{G,2}$, and the steady-state familiarity level would rise to 0.35 (point N in Figure 3). Although this represents a real improvement in living standards, it still leaves the economy far below the world leader in the permanent distribution of world income.

6.5. Full Convergence

Full convergence cannot take place with higher taxes alone. At some point, the degree of mercantilism must fall or the economy will continue to lag in relative income. A decline in m or σ also moves the κ_G locus to the right, leading the government to institute policies that open the nation to foreign competition and ideas.[23] As noted in the second column of Table 3, a decline in m to 0.10 raises familiarity significantly: if the tax base is high ($\tau = 0.30$), the government raises familiarity all the way to $\kappa = 0.82$. The steady state is shown as point P along $\kappa_{G,3}$ in Figure 3. This number is consistent with the income of nations like Australia, Germany, Japan, and Sweden (relative to the United States), all of whom have both higher tax rates and a greater degree of state collaboration with industry than does the United States.

Does full convergence require $m = 0$? As shown in the first column of Table 3, the answer is no. The government would voluntarily open the economy completely and select $\kappa = 1$ if $m = 0.05$ and $\tau = 0.20$. The latter figure is about the same as the average U.S. tax rate today. It is more difficult to measure the mercantilistic premium. In fact, there is no reason to believe, just because the United States leads the world in per capita income at this point, that it is completely open. It is more reasonable to assume that U.S. familiarity falls short of 1 but remains higher than that of other nations.

7. Conclusions

Even though a policy of openness maximizes individual welfare, raises short-run growth, and allows laggards to catch up to world leaders, such a policy is often not chosen by those in political power. Until we understand why not, we will not be able to fully account for the fact that convergence in living standards around the world is occurring at a very slow pace, if at all.

The explanation advanced here involves the concept of mercantilism, defined to be the collaboration between the government and private monopolies for the expansion of public revenue. By establishing monopoly rights for a certain firm and then siphoning off a part of its profit, a government may be able to increase its revenue beyond what is attainable with traditional sources. To make the monopoly right effective, however, it must close the economy to new ideas. The key familiarity parameter is reduced by conscious public policy. A serious consequence of this closure is a reduction in the ability of the citizenry to enhance human capital and provide economic growth.

I have shown that there is considerable support in the literature for the idea that mercantilism, in spite of the rhetoric, was primarily a system of fiscal enhancement. The formal model showed that two countervailing forces arise to change familiarity over time. On the one hand, the growth in human capital generates a tendency for familiarity to be reduced. On the other hand, a rise in the traditional tax rate tends to cause the government to raise familiarity. Nonetheless, if nothing can be done to reduce the degree of mercantilism, full convergence will remain elusive.

Appendix

Necessary Conditions for the Households

The Hamiltonian of this problem—after normalizing the initial population level at 1—is the following:

$$H = ln\, c + q_h \left[h^{1-\gamma}(\kappa\Omega)^{\gamma} e_L\right] + \lambda_1(\omega\, h\, e_W - c) + \lambda_2(1 - e_W - e_L). \tag{23}$$

The middle constraint on consumption comes from (16), where $\omega < \Omega$ because of taxes. The following first-order conditions arise:

$$\frac{1}{c} = \lambda_1, \tag{24}$$

$$\lambda_1 \omega\, h = \lambda_2, \tag{25}$$

$$q_h h \frac{\kappa^{\gamma}}{F} = \lambda_2, \tag{26}$$

and, as in the text $F = (\frac{h}{\Omega})^{\gamma}$. Eliminate the λ_i from these conditions, and use the constraint on consumption (16) to obtain (8).

The costate must move according to

$$\dot{q}_h = \rho q_h - \frac{\partial H}{\partial h}. \tag{27}$$

To obtain (10), begin with the definition $x \equiv q_h h$, and use (27) and (3). Differentiate (23) and use (24) to eliminate λ_1.

Numerical Representation of the Time Paths

Equations (10) and (11) form a nonlinear dynamic system in (F, x), given values of parameters, including κ. The first step is to find a numerical estimate for the policy function represented by the QA path in Figure 1 with $\kappa = 1$. To do so, I employed the time-elimination method (Mulligan and Sala-i-Martin, 1991). Call this numerical representation $x = v(F)$. The *general policy function*, which is relevant for different values of κ, is given by

$$x = P(F, \kappa) = v(F/\kappa^{\gamma}). \tag{28}$$

This simplification is possible because the entire system could be cast in terms of $E \equiv F/\kappa^{\gamma}$, in which case the motion and steady-state levels would be invariant with respect to κ.[24]

The general policy function, to emphasize, is a numerical approximation and does not have a simple closed form.

The next step is to find time paths for F and x. To do so, I first substituted the policy function for x into (11), set $\kappa = 1$, and solved the differential equation numerically beginning at $F_0 = 0.01$. Call the result the *baseline time path* $F = \kappa(t)$. The other baseline time path

is $x = L(t) = P(\kappa(t), 1.0)$. These are the values of the state variables at any time, given that F begins at the very low value of 0.01, and familiarity κ has the maximum value of 1.0. The baseline path is also the time path for E, defined above. This is very important because it allows us to generalize the paths to apply to any initial F and any given κ. We can easily generalize from the $E = F = \kappa(t)$ path because a change in κ changes the initial value of E but otherwise does not disturb the path. Therefore, consider the time t_z it takes for E to reach the value F_0/κ^γ. This time can be found by numerical methods. Call it $t_z = Q(\frac{F_0}{\kappa^\gamma})$. It then follows that in general $E = \kappa(t + Q(\frac{F_0}{\kappa^\gamma}))$. Finally, to find the time path for F for any values of F_0 and κ we multiply the last result by κ^γ:

$$F = F(t, F_0, \kappa) = \kappa\left(t + Q\left(\frac{F_0}{\kappa^\gamma}\right)\right)\kappa^\gamma. \tag{29}$$

To find x at any time, substitute (29) into the general policy function (28) to get

$$x = x(t, F_0, \kappa) = P(F(t, F_0, \kappa), \kappa). \tag{30}$$

These two functions correspond to the $F(\cdot)$ and $X(\cdot)$ functions in the government's revenue integral (20) and appear as the ratio in the $B(\cdot)$ function in (21).

The two time paths are strictly numerical. That is, they are sequences of short functions spliced together to span the range that was specified. Nevertheless, once values for the fiscal parameters (τ, m, σ), the initial condition (F_0), and familiarity κ are specified, equation (21) can be integrated numerically to find a value for government revenue. It is also possible, using numerical methods, to form a graph of J as a function of κ, and to maximize J with respect to κ.

To construct Figure 3, I began with $F_0 = 1$, maximized J to find κ; then used that κ to see how long it would take F to reach 5. At that time (about twenty-three years) I then used $F_0 = 5$ to begin the process anew. Iterations proceeded until the steady state at L was found. This procedure was used repeatedly to fill in the values in Table 3.

All numerical routines were run with *Mathematica* version 3.0.

Acknowledgments

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Notes

1. The first proposition has been supported in a series of papers by Quah (e.g., 1996, 1997) and in the work of Parente and Prescott (1993), Jones (1997), and Pritchett (1997). The second proposition has been investigated for a long time. Although much of this work finds a positive relation between trade and growth (e.g., Feder, 1982; Edwards, 1993; and Harrison, 1995) the work is subject to criticism for not dealing adequately with simultaneity. That problem is addressed in the paper by Frankel, Romer, and Cyrus (1996), who use a gravity equation to produce instruments for the measure of openness. Ben-David (1996) shows that groups of nations that trade with one another also converge in terms of per capita GDP, which is consistent with the idea that openness enables lagging countries to catch up to leaders within the group. In work that is directly related to the present article, Hall and Jones (1998) show that countries that speak an international language are more likely than others to have high GDP per worker. Language, unlike the trade share, is an exogenous (if imperfect) measure of openness to international ideas.
2. The term *mercantile system* may have originated with Adam Smith (1776, Book 4), who compared it unfavorably to classical laissez-faire. It was a hundred years later that Gustav von Schmoller (1886) used the term *mercantilism* in his analysis of national unification in the context of Frederick the Great's policy of wresting control of the economy from cities and towns in Prussia. The classic work on mercantilism is Eli Heckscher's (1935) lengthy treatise.
3. Jacob Viner (1937, p. 115) noted that "the bulk of the mercantilist literature" was nothing more than special-interest pleading, often disguised as disinterested policy analysis. Heckscher's (1935) and Heaton's (1937) quotes at the beginning of this article shows that both were well aware of this aspect of mercantilism.
4. Other theoretical works that draw the link between knowledge and growth in the international economy include Grossman and Helpman (1991), Barro and Sala-i-Martin (1997), and Eaton and Kortum (1996).
5. It is impossible to ignore the fact—emphasized by Romer (1990, 1996)—that many technical ideas *are* sufficiently proprietary that they cannot be freely used everywhere (so that Ω is not identical across countries). In this article, I do not deal with the ability to exclude others from technical ideas.
6. Equations (1) and (2) are adapted in simplified form the two-country model of Goodfriend and McDermott (1998). A more precise account is given there of the determination of technology Ω and the effect of familiarity κ on the formation of human capital.
7. One way to justify this assumption is to assume that spending on productive public goods is matched by spending on destructive goods, both for rent seeking and war, in such a way that there is no net effect on current output. Rosenthal (1998) places war spending at the heart of his model. McGuire and Olson (1996) construct a model in which the desire for revenue is tempered by the need to provide public goods and the dead-weight cost of taxation. Their main focus is on the level of taxation in a static economy under different political structures. Robinson (1997) recognizes that the state may decide not to provide public goods because it makes political change less costly. As here, in his model the state chooses an inefficient outcome to maintain its own wealth at the expense of the population as a whole.
8. This assumption is a simplification. As suggested by a referee, one could think of this rate as one that maximizes revenue in Laffer-Curve fashion. It is reasonable to assume that this rate rises with the level of development. Even so, there are exceptions to the proposition that high direct taxation requires high development. Peter the Great was able to extract an extraordinarily high fraction of income directly from bonded peasants. Although his economy was at a very low level of development, he had more power than most rulers of the mercantile or modern period (Mavor, 1925, chap. 6). In practice, *average* tax rates shows little variation in developed nations: the average tax rate in the United States has been steady at about 20 percent for decades (*Economic Report of the President* 1997).
9. Parente and Prescott (1998) develop a much richer structure to explain why monopolization is detrimental to output. They do not consider openness or growth explicitly, but their underlying mechanism—a failure to adopt superior technology—is similar to that here.
10. Although the mercantilistic tax premium is exogenous here, a referee pointed out that one could look at this parameter as the result of a Nash bargaining process between monopolies and the government. An elaboration of this process would allow us to relate the value of m to other exogenous variables.
11. For the record, Heckscher identified the following guiding principles of mercantilism: unification, national power, protectionism, money and trade, and social concept.

12. Heckscher's claim that 16,000 people were put to death over calico smuggling and production has been disputed by Ekelund and Tollison (1981, p. 94).
13. The conflict between the monarch and an elite (represented by Parliament in England and the Estates General in France) is modeled as a game of fiscal control to seek fortunes via war by Rosenthal (1998). His approach emphasizes, as I do here, that it is impossible to separate efficiency and institutions from the fiscal desires of rulers. According to Ekelund and Tollison (1981, p. 69), Parliament was not as mercantilistic in its policy choices because the costs were greater for a democratic institution than for a monarch.
14. The foregoing follows Robinson (1997) closely. He cites, among others, Vedovato (1986) and Wiarda (1968) for Trujillo, Rempel (1993) for Marcos, Crawley (1979) for Somoza, and Lundahl (1992) for Haiti.
15. Southeast Asia presents an intriguing case, with no consensus about what caused its generally high growth from the mid-1970s to the mid-1990s. South Korea and Taiwan appear to corroborate the importance of familiarity, since they opened considerably just before their growth took off (Bruton, 1998). Still, they, like Japan, relied on industrial policy more than is often acknowledged. All three appear to have found a way to raise κ even as their governments maintained control over investment. This may have been true also, though to a smaller extent, of Indonesia and Malaysia, who, in spite of crony capitalism, managed high growth during part of the period. Recent developments in the latter, however, make us realize that it is too early to tell if their success will be long lasting.
16. To derive (20), substitute (18) for R, and subsequently (1) for y. Following this, use (4) to eliminate h and (8) to eliminate e_W.
17. See the appendix for an explanation of how the policy function and time paths are found.
18. By "state of economy F," I mean the value of F that exists whenever the government makes its decision over κ. As noted earlier, this will happen at discrete, random times.
19. Although some strife-ridden nations in Africa go as low as 2 percent of U.S. GDP, I do not set the minimum κ that low for technical reasons. When κ is that low, it is possible that no steady state exists for some otherwise reasonable parameter values.
20. Mancur Olson (1982) emphasized the fact that nations face discrete opportunities, which may look like disasters, to liberalize both internally and externally.
21. All of the numbers in this section come from Summers and Heston (1991).
22. For F above M, there may exist a *local* maximum to the government's objective function away from the corner, but if so, the value of the revenue integral there falls below the value provided by the minimum κ.
23. The government does not care if its mercantile income rises because the monopolists have succeeded in raising the transfer rate from households (a greater σ) or because the government itself is better able to obtain more revenue from the monopolists (a larger m). As we see from (21) only the product $m\sigma$ is important. In Table 3, then, we could replace the m-values with σ-values of the same proportional magnitude. From the point of view of the private sector, however, it does matter, even before any changes in familiarity occur: monopolists prefer a larger σ, while households prefer a larger m.
24. Both the lower and upper stable arms were found. In this appendix, however, I focus only the lower path.

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