Creative Destruction and Development: Institutions, Crises, and Restructuring

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Creative destruction, driven by experimentation and the adoption of new products and processes when investment is sunk, is a core mechanism of development. Obstacles to this process are likely to be obstacles to progress in standards of living. Underdeveloped and politicized institutions are a major impediment to a well-functioning process of creative destruction. They result in sluggish creation, technological "sclerosis," and spurious reallocation of factors of production. These ills reflect the macroeconomic consequences of contracting failures in the presence of sunk investments. Recurrent crises are another major obstacle to creative destruction. The common inference that increased liquidations during crises result in increased restructuring is unwarranted. On the contrary, there are indications that crises freeze the restructuring process, an effect associated with the tight financial market conditions that follow a contraction. This productivity cost of recessions adds to the traditional costs of resource underutilization.

The world economy is undergoing momentous reorganization in the face of the development and large-scale adoption of information technologies. Alan Greenspan (1999) describes the United States' recent experience of such reorganization:

> The American economy, clearly more than most, is in the grip of what . . . Joseph Schumpeter . . . called "creative destruction," the continuous process by which emerging technologies push out the old. . . . The remarkable . . . coming together of the technologies that make up what we label IT—information technologies—has begun to alter, fundamentally, the manner in which we do business and create economic value.

This wave of restructuring is only the latest manifestation of creative destruction—by which the production structure weeds out unproductive segments; upgrades its technology, processes, and output mix; and adjusts to the evolving regulatory and global environment.

Ongoing restructuring is as relevant for the developing world as it is for economies at the leading edge of technology. In this article we draw on significant advances over the past decade in theoretical and empirical research on creative destruction to formulate propositions about the role and workings of this mechanism in the development process. Some of these ideas are firmly grounded in empirical evidence; others are no more than hypotheses, consistent with a combination of theoretical considerations and scattered evidence and deserving of systematic investigation in the future.

The rest of this article is organized into three sections. The first section reviews recent international evidence on gross job flows that supports the idea that creative destruction is a core mechanism of growth in market economics. The second section shows how underdeveloped and politicized institutions in the developing world are likely to constitute a major obstacle to a well functioning creative destruction process, and explores their consequences. The third section argues that recurrent crises in developing countries are a second major obstacle to creative destruction and reviews evidence indicating that such crises can freeze the restructuring process.

Creative Destruction and Economic Growth

The notion that creative destruction is at the core of economic growth in market economies goes back to Joseph Schumpeter (1942), who considered it "the essential fact about capitalism" (p. 83). Underlying any notion of restructuring is the assumption that choices of technology, output mix, and modes of organization are embodied in capital and skills. The resulting irreversibility of investment means that adjusting the production structure requires scrapping existing investments and replacing them with new ones. Conversely, if capital were perfectly malleable and skills fully generic, adjustment would be costless and instantaneous. Conceptually, it is the embodiment of technology combined with incessant opportunities to upgrade the production structure that places ongoing restructuring at the core of the growth process, regardless of whether the economy is a technological leader or a laggard.

Restructuring is closely related to factor reallocation. If investments need to be scrapped, it is because they are working with factors of production that must be freed up to combine with new forms of investment. In other words, restructuring generates a reallocation of factors in which technology is not embodied. This link has been exploited empirically to develop measures of reallocation that can be used as an index of restructuring. The most successful measures that have been developed are based on labor reallocation, although studies have attempted to look at other factors (see, for example, Ramey and Shapiro 1998).[1]

The literature on gross job flows has constructed measures of aggregate gross job creation and destruction based on microeconomic data at the level of business units—plants or firms (see Davis and Haltiwanger forthcoming for an excellent sur-

vey). Gross job creation over a given period is defined as employment gains summed over all business units that expand or start up during the period; gross job destruction refers to employment losses summed over all units that contract or shut down. Although job flows are a useful indicator of restructuring, the link between the two is loose. Plant equipment and organization could be entirely upgraded with no change in the number of jobs; conversely, jobs could migrate from one location to another (such as for tax reasons) with no change in the activity performed.

From the many studies that construct measures of job flows for different countries, three features of the data have emerged that allow us to characterize the role of creative destruction in the growth process:

- Gross job creation and destruction are large, ongoing, and persistent.
- Most job flows take place within rather than between narrowly defined sectors of the economy.
- Reallocation of jobs from less productive to more productive business units plays a major role in industry-level productivity growth.

Gross Job Flows—Large, Ongoing, and Persistent

Job flows are generally large, both in high-income countries and in the few developing and transition economies for which we have data (table 1). An average of at least one in 10 jobs commonly turns over in a year. Job creation and destruction are simultaneous and ongoing. In the U.S. manufacturing sector in 1973–88, for example, the lowest rate of job destruction in any year was 6.1 percent, in the 1973 expansion, and the lowest rate of creation was 6.2 percent, in the 1975 recession (Davis, Haltiwanger, and Schuh 1996, table 2.1). Moreover, the bulk of those flows did not reflect temporary layoffs, which would not correspond to true restructuring. Data for several countries show high persistence rates for job creation and destruction (the percentage of newly created jobs that remain filled over the period, or of newly destroyed jobs that do not reappear) over one- and two-year periods (table 2). Overall, job flow data indicate extensive, ongoing restructuring.

Job Flows Largely within Rather Than between Sectors

To measure the creation and destruction that take place simultaneously beyond what is required to accommodate net employment changes, we define excess job reallocation as the sum of job creation and destruction minus the absolute value of net employment change. In data for several economies the share of excess job reallocation accounted for by employment shifts between narrowly defined sectors never exceeds 20 percent, and it is typically far smaller (table 3).

Two major factors seem to be behind reallocation within sectors: adjustment and experimentation. Several job characteristics that are important determinants of employment adjustment are not captured by output-based sectoral classifications. A job may be associated with outdated capital or skills (see, for example, Caballero and Hammour 1996b) or may have suffered a highly idiosyncratic disruption. Experimentation, in the

Table 1. Average Annual Gross Job Flows in Selected Countries

(percentage of employment)

Country	Period	Coverage	Employer unit	Job creation	Job destruction
High income					
Canada	1974–92	Manufacturing	Plant	10.9	11.1
Canada	1983–91	All employees	Firm	14.5	11.9
Denmark	1981–91	Manufacturing	Plant	12.0	11.5
Denmark	1983–89	Private sector	Plant	16.0	13.8
Finland	1986–91	All employees	Plant	10.4	12.0
France	1985–91	Manufacturing	Firm	10.2	11.0
France	1984–92	Private sector	Plant	13.9	13.2
Germany	1983–90	All employees	Plant	9.0	7.5
Italy	1984–93	Private sector	Firm	11.9	11.1
Netherlands	1979–93	Manufacturing	Firm	7.3	8.3
New Zealand	1987–92	Private sector	Plant	15.7	19.8
Norway	1976–86	Manufacturing	Plant	7.1	8.4
Sweden	1985–92	All employees	Plant	14.5	14.6
United Kingdom	1985–91	All employees	Firm	8.7	6.6
United States	1973–93	Manufacturing	Plant	8.8	10.2
United States [a]	1979–83	Manufacturing	Plant	10.2	11.5
United States [a]	1979–83	Private sector	Plant	11.4	9.9
Middle and low income					
Chile	1979–86	Manufacturing	Plant	13.0	13.9
Colombia	1977–91	Manufacturing	Plant	12.5	12.2
Estonia	1992–94	All employees	Firm	9.7	12.9
Morocco	1984–89	Manufacturing	Firm	18.6	12.1

a. Selected states. Based on data for employers covered by unemployment insurance.
Source: Davis and Haltiwanger forthcoming, table 3.2.

Table 2. Average Persistence Rates for Annual Job Flows in Selected Countries

(percent)

Country	Period	One-year horizon		Two-year horizon	
		Job creation	Job destruction	Job creation	Job destruction
Denmark	1980–91	71.0	71.0	58.0	58.0
France	1985–90	73.4	82.1	51.5	68.2
Netherlands	1979–93	77.9	92.5	58.8	87.3
Norway	1977–86	72.7	84.2	65.1	79.8
United States	1973–88	70.2	82.3	54.4	73.6

Note: The persistence rate refers to the percentage of newly created jobs that remain filled over the period, or of newly destroyed jobs that do not reappear.
Source: Davis and Haltiwanger forthcoming, table 3.6.

face of uncertain market prospects, technologies, cost structures, or managerial ability, appears to account for a large share of job flows (see, for example, Jovanovic 1982). This idea is supported by evidence from U.S. manufacturing and elsewhere that younger plants exhibit higher excess reallocation rates, even after a variety of plant characteristics are controlled for (see Davis and Haltiwanger forthcoming).

Traditional analyses of restructuring in the trade and development literature emphasize one dimension of creative destruction—major shifts between the main sectors of the economy. Much less attention goes to the multitude of creation and destruction

Table 3. Share of Excess Job Reallocation Accounted for by Employment Shifts between Sectors in Selected Countries

Country	Period	Classification scheme	Employer unit	Number of sectors	Average number of workers per sector (thousands)	Share of excess reallocation from shifts between sectors (percent)
High income						
Finland	1986–91	2-digit ISIC	Plant	27	49	6
France	1985–91	Detailed industry	Firm	600	37	17
Germany	1983–90	2-digit ISIC	Plant	24	1,171	3
Italy	1986–91	2-digit SIC private sector	Firm	28	322	2
Netherlands	1979–93	2-digit SIC	Firm	18	10	20
New Zealand	1987–92	2-digit ISIC	Plant	28	28	1
Norway	1976–86	5-digit ISIC manufacturing	Plant	142	2	6
Sweden	1985–91	2-digit ISIC	Plant	28	112	3
United States	1972–88	4-digit SIC manufacturing	Plant	448	39	13
Middle and low income						
Chile	1979–86	4-digit manufacturing	Plant	69	4	12
Colombia	1977–91	4-digit manufacturing	Plant	73	6	13
Morocco	1984–89	4-digit manufacturing	Plant	61	4	17

Note: ISIC is the International Standard Industrial Classification. SIC is the Standard Industrial Classification.
Source: Davis and Haltiwanger forthcoming, table 3.5.

decisions driven by highly decentralized, idiosyncratic factors and experimentation. Consideration of the role played by these underlying flows may shed new light on many conventional questions in development. For example, Levinsohn (1999) and Melitz (1999) argue that a significant benefit of trade reform arises through factor reallocation toward more productive firms. Similarly, Olley and Pakes (1996) find that deregulation in the U.S. telecommunications industry increased productivity predominantly through factor reallocation toward more productive plants rather than through productivity gains within plants. Another example, which we discuss later, is the effect of crises on restructuring activity and the costs of this effect in terms of productivity.

Job Reallocation a Major Factor in Productivity Growth

The function of large job flows within sectors and their relationship to productivity gains brings us to the third feature of the data, the evidence that factor reallocation is a core mechanism in productivity growth. In a careful study and survey of this issue Foster, Haltiwanger, and Krizan (forthcoming) examine U.S. manufacturing industries (classified at the four-digit level) over the 10 years from 1977 to 1987. They decompose industry-level multifactor productivity gains over the period into a within-plant term and a reallocation term. The within-plant term reflects productivity gains within continuing plants weighted by their initial output shares; the reallocation term reflects productivity gains associated with reallocation among continuing, entering, and exiting plants. They find that reallocation accounts on average for 52 percent of 10-year productivity gains. Entry and exit account for half this contribution: plants that exit during the period have lower productivity than continuing plants, while plants that enter catch up with continuing

plants only gradually, through learning and selection effects. Other studies of U.S. manufacturing based on somewhat different methodologies concur with the conclusion that reallocation accounts for a major part of the productivity growth within industries (Baily, Hulten, and Campbell 1992; Bartelsman and Dhrymes 1998).

It would be of great interest to know whether restructuring is as productive in developing countries as it is in the United States, but relevant studies are few and they raise methodological issues. Aw, Chen, and Roberts (1997) look at the question in Taiwan (China) and Liu and Tybout (1996) address it in Colombia, but both studies define the within-plant term of their productivity decomposition on the basis of a plant's average share over the period rather than its initial share.[2] As Foster, Haltiwanger, and Krizan (forthcoming) discuss, this approach tends to underestimate the contribution of reallocation between continuing plants.

Moreover, both studies conduct their decomposition over a horizon of less than 10 years: 5 years for Taiwan (China) and only 1 for Colombia. This reduces the contribution of entry, which takes place dynamically through learning and selection effects. This short-sample decomposition also is more sensitive to the cyclicality of productivity, which can be expected to affect productivity growth mostly within plants. The studies show that reallocation accounts for 34 percent of average productivity gains in Taiwan (China) and almost zero in Colombia.[3] Given the methodological differences between these studies and those in the United States, it is difficult to know whether these results imply that factor reallocation is less productive in those developing economies than it is in the United States.

The evidence of extensive, ongoing job flows that act as a major mechanism of productivity growth points to the centrality of creative destruction in the growth process. A corollary is that obstacles to creative destruction are likely to be obstacles to development and thus should be of central concern in development theory and policy. Such potential obstacles are the focus of the rest of this article.

Institutions and Restructuring

We have seen that the notion of restructuring presumes that investment is partly irreversible. When two factors of production enter into a production relationship, they develop a degree of specificity with respect to each other and to the choice of technology, in the sense that their value within this arrangement is greater than their value outside it. In the presence of specificity the institutional environment becomes critical. The reason is that irreversibility in the decision to enter a production relationship with another factor creates ex post quasi rents that need to be protected through ex ante contracting (Klein, Crawford, and Alchian 1978). If contracting ability is limited, the institutional environment determines the rules by which those quasi rents are divided. Poor institutions, by definition, prevent one of the parties to a transaction from getting the value of what it put in. This disrupts the broad range of financing, employment, and output sale transactions that underlie a healthy process of creative destruction.

We view institutional failure as the root obstacle to economic growth in the developing world (see Lin and Nugent 1995 for a broad review). This leads us to the pre-

sumption that poor institutions are likely to constitute a major disruption to creative destruction. To the extent that irreversibility of investment takes on an entirely new dimension in the presence of contracting difficulties, it becomes crucially important in the analysis of development.

In this section we propose a simple model of the distortions likely to affect the restructuring process and examine related empirical evidence. Our treatment of institutions is deliberately very generic. Our purpose is not to comment about specific arrangements, but to identify a common element that is likely to systematically affect creative destruction and that is shared by many examples of institutional failure—such as overly protective labor regulations, highly politicized and uncertain regulation of competition, and financial markets that lack transparency and investor protection.

Theoretical Considerations

We develop a basic model, based on Caballero and Hammour (1998b), that focuses on specificity in financing and employment relationships and its implications for aggregate restructuring. For this purpose we introduce three factors of production: capital, entrepreneurs, and labor. The specificity of capital with respect to entrepreneurs affects financing transactions; its specificity with respect to labor affects employment transactions. All three factors exist in infinitesimally small units. Entrepreneurs and labor have linear utility in the economy's unique consumption good, which we use as numeraire.
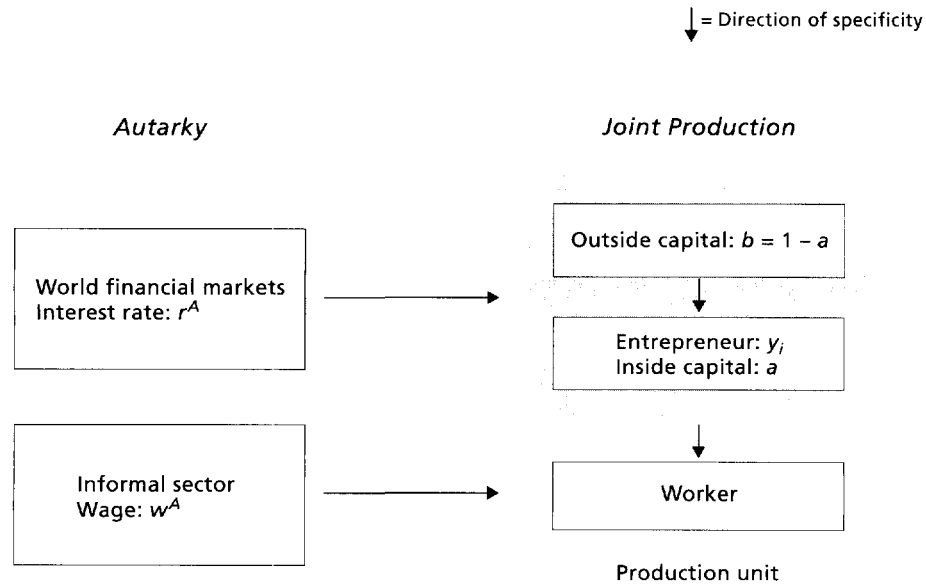
Contracting obstacles affect the possibility of economic cooperation. To capture their implications at a general level, we define for each factor two possible modes of production: autarky and joint production (figure 1). In joint production the three factors combine in fixed proportions to form production units. Each such unit is made up of a unit of capital, an entrepreneur i, and a worker. Each entrepreneur i has an innate level of skill that determines the production unit's productivity, measured by the amount, y_i, of the consumption good the unit can produce. Each entrepreneur also starts with a level of net worth $a_i \geq 0$ that can finance part of the unit's capital requirement. The remaining financing requirement, $b_i = 1 - a_i$, is provided by external financiers. We assume that workers start with zero net worth. Cooperation in joint production gives rise to investment specificity: once committed, capital is fully specific to the entrepreneur and the worker. It has no ex post use outside its relationship with them.

The autarky mode of production is free from investment specificity. If factors do not participate in a joint production unit, they can operate in the following autarky modes: Capital can be invested in the international financial markets at a fixed world interest rate $r^A > 0$ (A stands for autarky). An entrepreneur can also invest his net worth at the world interest rate. Workers can find employment in the informal sector at a wage w^A given by the informal sector labor demand function:

$$(1) \qquad U = U(w^A), \quad U' < 0 ,$$

where U stands for informal sector employment.

Figure 1. Autarky and Joint Production

$\downarrow$ = Direction of specificity

Autarky   *Joint Production*

Outside capital: $b = 1 - a$

$\downarrow$

Entrepreneur: y_i Inside capital: a

$\downarrow$

World financial markets Interest rate: r^A

Informal sector Wage: w^A

Worker

Production unit

To analyze restructuring, we assume that the economy starts with preexisting production units as well as a supply of uncommitted factors of production. Events occur in three consecutive phases: destruction, creation, and production. In the destruction phase the factors in all preexisting units decide whether to continue to produce jointly or to separate and join the uncommitted factors. In the creation phase uncommitted factors either form new joint production units or remain in autarky. In the last phase production takes place and factor rewards are distributed and consumed. If the factors in a joint production unit separate after the creation phase, their only option is to move back to autarky.

Introducing preexisting units allows us to analyze destruction decisions. We assume that the units' productivity distribution is over the interval $y^o \in (0, y^{max})$ and, for simplicity, that it has negligible mass. The supply of uncommitted factors is as follows: The supply of capital is unlimited. The supply of entrepreneurs with any given productivity $y \in (0, y^{max})$ is also unlimited, but not all entrepreneurs have positive net worth. We assume that entrepreneurs with positive net worth are distributed according to a uniform density $\phi > 0$ for each productivity level and that they all have sufficient funds to fully finance a production unit ($a_i > 1$). The aggregate mass of labor is one, so that employment in joint production is given by

$$(2) \qquad\qquad L = 1 - U(w^A) .$$

Efficient equilibrium. We first derive the economy's efficient equilibrium conditions, which would arise if agents had perfect contracting ability. We restrict ourselves

to parameter configurations that result in an interior equilibrium $(0 < L < 1)$. On the creation side, since the supply of entrepreneurs with the highest productivity y^{max} is unlimited and the autarky return on capital is r^A, labor's autarky wage must satisfy

$$(3) \qquad\qquad w^{A*} = y^{max} - r^A.$$

(The asterisk denotes efficient equilibrium values.) Any wage below this value would induce infinite joint production labor demand; any wage above this value would induce zero demand. The labor demand and supply system given by equations 2 and 3 determines the efficient equilibrium creation of joint production units, as illustrated in figure 2. The joint production rewards for capital and labor are equal to their autarky rewards, and the reward for entrepreneurs is zero because of their unlimited supply.

On the destruction side, scrapping the capital invested in a preexisting unit frees up a unit of labor. Efficient exit will therefore affect all units with productivity levels

$$(4) \qquad\qquad y^o < w^{A*}.$$

INCOMPLETE-CONTRACTS EQUILIBRIUM. Because of investment specificity, implementing the efficient equilibrium requires a contract that guarantees capital in joint production its ex ante opportunity cost r^A. The contracting incompleteness we introduce is due to the inalienability of human capital, which renders unenforceable any contract clause that removes the right of the entrepreneur or worker to walk away from the joint production relationship ex post (see Hart and Moore 1994). This affects both the employment transaction between labor

Figure 2. Efficient and Incomplete-Contracts Equilibria
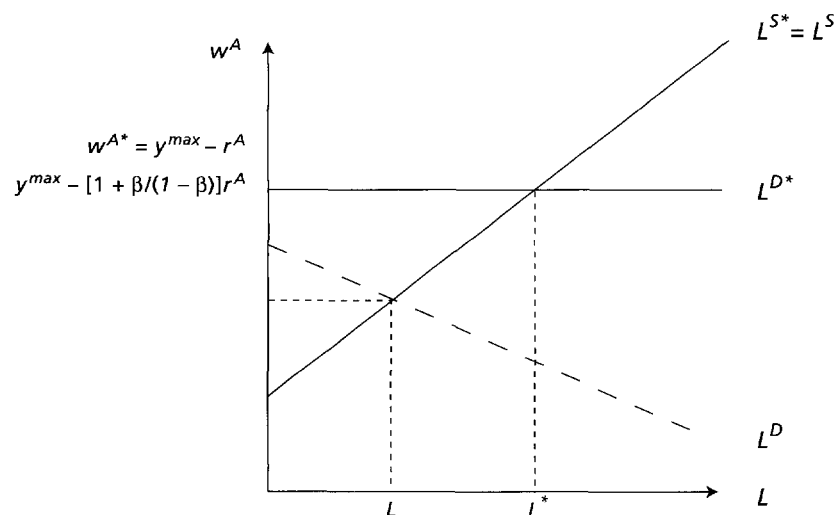
and capital and the financing transaction between the entrepreneur and external financiers.

In the employment relationship we assume that the worker deals with the entrepreneur and his financier as a single entity.[4] If production unit i has productivity y_i, its associated specific quasi rent, s_i, is the difference between the unit's output and its factors' ex post opportunity costs:

$$(5) \qquad\qquad s_i = y_i - w^A ,$$

given that the worker moves to autarky if he leaves the production unit. Consistent with the Nash bargaining solution for sharing the unit's output, we assume that each party gets its ex post opportunity cost plus a share of the surplus s_i. If $\beta \in (0,1)$ denotes labor's share,

$$(6) \qquad\qquad w_i = w^A + \beta s_i \quad \text{and} \quad \pi_i = (1 - \beta)s_i ,$$

where w_i denotes the rewards of labor and π_i the rewards of capital. The contracting problem adds a rent component βs_i to wages.

In the financing relationship the associated specific quasi rents correspond to the full profit, π_i, because the ex post outside options of the entrepreneur and external financiers are worthless. Again, because of the inalienability of human capital, no contract can prevent the entrepreneur from threatening to leave the relationship. Any contract can be renegotiated according to the Nash bargaining solution, which gives the entrepreneur a share $\alpha \in (0,1)$ of π_i and the external financier a share $1 - \alpha$. The production unit's outside liability can therefore never exceed

$$(7) \qquad\qquad r^A b_i \leq (1 - \alpha)\pi_i .$$

This financial constraint places a lower bound on the net worth, $a_i = 1 - b_i$, that the entrepreneur needs to start a project, which can be written as

$$(8) \qquad\qquad a_i \geq 1 - (1 - \alpha)(1 - \beta)(y_i - w^A)/r^A$$

based on equations 5 and 6. We assume that a is large enough so that equation 8 requires positive net worth when $y_i = y^{max}$. This implies that only entrepreneurs with positive net worth can enter joint production, in which case we have assumed that they have enough funds to fully finance a production unit.

We now solve for the incomplete-contracts equilibrium conditions. In the creation phase an entrepreneur able to finance a production unit will find it profitable to do so if

$$(9) \qquad\qquad \pi_i \geq r^A ,$$

which, given equations 5 and 6, is equivalent to

(10) $$y_i \geq w^A + [1 + \beta/(1 - \beta)]r^A .$$

Because of the rent component in wages, capital behaves as if it faced a world interest rate higher than r^A. The joint production demand for labor is given by the mass of entrepreneurs whose productivity satisfies equation 10 and who can finance a production unit:

(11) $$L = \phi [y^{max} - w^A - [1 + \beta/(1 - \beta)]r^A] .$$

Together with equation 2 for the supply of labor, this equation determines the incomplete-contracts equilibrium level of L. As illustrated in figure 2, labor demand (equation 11) under incomplete contracts falls below its efficient economy counterpart (equation 3). This occurs both because of labor market rents (which shift the curve down vertically) and because of the financial constraint (which rotates the curve down around its vertical axis intercept). In the incomplete-contracts equilibrium joint production employment and autarky wages are lower than their efficient equilibrium counterparts:

(12) $$L < L^* \quad \text{and} \quad w^A < w^{A^*} .$$

In the destruction phase a worker who leaves a preexisting production unit will find employment in joint production with probability L, in which case we denote his expected wage by $E(w)$, and will remain in autarky with probability $(1 - L)$, in which case his wage will be w^A. The exit condition is therefore[5]

(13) $$y^o < L\, E(w) + (1 - L)\, w^A .$$

CHARACTERIZATION OF EQUILIBRIUM. We now characterize the general equilibrium consequences of incomplete contracting. The imbalances we describe constitute a highly inefficient macroeconomic solution to the unresolved microeconomic contracting problems. The first are highly suggestive of the experience of developing countries but pertain only indirectly to restructuring.

- *Reduced cooperation.* At the purely microeconomic level it is well known that limited contracting ability hampers cooperation. We have seen that under limited contracting ability even joint production projects with positive value may not be undertaken because workers (equation 6) or entrepreneurs (equation 7) can capture rents beyond their ex ante opportunity costs.
- *Underemployment.* As we have seen in the discussion of equation 12, joint production is characterized by underemployment ($L < L^*$), which is an equilibrium consequence of obstacles to cooperation in the financial and labor markets. In partial equilibrium, rent appropriation reduces the joint production return on capital. To restore this return to the level r^A required by world markets, fewer joint production units are created, informal sector employment bal-

loons, and the opportunity cost component w^A of wages falls (equation 6). The extent of underemployment generally depends on the supply elasticity of the factor that suffers from specificity, which we assume here to be infinite.

The counterpart of underemployment in joint production is an over-crowded informal sector $(U > U^*)$. The informal sector becomes over-crowded because we have assumed no need for contracting in autarky. We view the informal sector as one in which transactional problems are less severe because there is less need for cooperation with capital (because of low capital intensity or constant returns, because employment regulations can be evaded, and so on).[6]

- *Market segmentation.* In the incomplete-contracts equilibrium both the labor market and the financial market are segmented. There are workers and entrepreneurs in autarky who would prefer to move into joint production but are constrained from doing so. Put another way, those two factors earn rents in joint production. It is easy to see that the rent component of joint production wages in equation 6 is positive, raising the wages above the informal sector wage.[7] But the presence of rents does not entail high wages—quite the contrary. Joint production wages are lower under incomplete contracts than in the efficient economy. To see this for any production unit i, substitute $\pi_i = y_i - w_i$ into equation 9 to get

$$(14) \qquad\qquad w_i \leq y_i - r^A \leq y^{max} - r^A = w^{A^*}.$$

The rent component of wages arises as a result of depressed wages in the informal sector, not because of high wages in joint production. Similarly, from equation 10 it is clear that an entrepreneur with intramarginal productivity y_i earns positive rents equal to $y_i - w^A - [1 + \beta/(1 - \beta)]\, r^A$ associated with the scarcity of internal funds. Those rents would not arise in an efficient equilibrium.

We now turn to the characteristics of equilibrium that pertain directly to restructuring. The first three properties characterize the amount of equilibrium creation and destruction of joint production units; the last two characterize the quality of restructuring, understood as the net gain that results from it.

- *Depressed creation.* Since creation in this economy is equal to $L < L^*$, it follows that the equilibrium rate of creation is depressed compared with creation in the efficient economy.
- *Sclerosis.* The joint production structure suffers from sclerosis, in the sense that some production units survive that would be scrapped in an efficient economy. To see this, compare the efficient and incomplete-contracts exit conditions (equations 4 and 13). Since $w^A < w^{A^*}$ was shown in equation 12 for autarky and $w_i < w^{A^*}$ in equation 14 for joint production, it is clear that cost pressures to scrap are lower in the incomplete-contracts than in the efficient equilibrium. Sclerosis is thus a result of the underutilization and low productivity of labor. Sluggish creation and sclerosis can be a heavy drag on aggregate productivity.
- *Unbalanced restructuring.* Destruction is excessively high compared with the depressed rate of creation. To see this, note that the private opportunity cost

used in equation 13 for exit decisions is higher than the social shadow wage w^A of labor. The reason is that it is possible to capture a rent component in wages, which distorts the private opportunity cost of labor upward. That the economy exhibits both sclerosis and excessive destruction may appear paradoxical. In fact, the sclerosis reflects a comparison with the efficient equilibrium, the excessive destruction reflects a comparison between private and social values within the incomplete-contracts equilibrium. The imbalance of gross flows is closely related to the presence of rents and market segmentation. In Caballero and Hammour (1996a) we argue that this imbalance sheds light on the nature of employment crises in developing countries.

- *Scrambling.* In the efficient economy only the most productive entrepreneurs, with $y = y^{max}$, are involved in joint production. If the number of such entrepreneurs had been insufficient, others would have been brought in according to a strict productivity ranking. On the creation side an efficient process should result in implementation of the most productive projects. This ranking is scrambled in the incomplete-contracts equilibrium because another characteristic of the entrepreneur—net worth—comes into play. This tends to reduce the quality of the churn, as the same volume of scrapping and reinvestment will result in a smaller productivity gain.

- *Privately inefficient separations.* Another important consequence of contracting difficulties, although one that we have not incorporated in our model, is the possibility of privately inefficient separations. Such separations can arise as a result of factors similar to those that make creation privately inefficient—by constraining agents from starting positively valued projects. For example, assume that a production unit goes through a period of negative cash flow that must be financed if the unit is to remain in operation. Continuation investment would help preserve the unit's specific capital and is therefore itself specific and subject to a financial constraint. When the financial constraint is binding, destruction can be privately inefficient and result in losses for the owners of both labor and capital (for details see Caballero and Hammour 1999). This gives rise to another factor that reduces the quality of restructuring, since it generates spurious churn with little payoff in productivity gains. Moreover, once we admit the possibility of private inefficiency on the destruction margin, factors other than productivity may affect destruction decisions and also scramble the productivity ranking on the exit margin.

POLITICAL ECONOMY. Although in our model contracting incompleteness is based on the inalienability of human capital, it can be due to a variety of other factors. In particular, the legal and regulatory framework can be a source of factor specificity and provide the institutional framework that determines the division of specific rents. Legal restrictions on employee dismissals, for example, would effectively make capital partly specific to labor in the joint production relationship. Moving beyond an exogenous view of institutions, we look at some of the underlying causes of institutional obstacles to efficient restructuring.

Institutions serve two distinct functions: efficiency and redistribution. It is naive to think that markets can generally function properly without an adequate institutional framework. We have seen that the basic principle that determines institutions in their efficiency role is that each factor ought to get out the social value of what it put in—absent any externalities, its ex ante terms of trade. But it is equally naive to think that such institutions, being partly determined in the political arena, will not also be used as an instrument in the politics of redistribution. A poor institutional framework is the result of underdeveloped contracting and regulations combined with overly powerful political interest groups that have tilted the institutional balance excessively in their favor.

By displacing technologies and skills, creative destruction threatens a variety of incumbent interests and therefore can itself give rise to political opposition and endogenous institutional barriers. Mere uncertainty about the impact of restructuring can prop up opposition (Fernandez and Rodrik 1991). Mokyr (1992) discusses many historical examples of resistance to technology adoption, perhaps the most well known of which is the 19th-century Luddite movement in Britain (Thomis 1972). The resistance can range from mere neglect of urgent institutional reform to active barriers affecting trade, competition, regulation, the size of the government sector, and the aspects of financial and labor markets that we focus on in our model.

But protection of labor or other factors characterized by relatively inelastic supply can backfire, resulting in large-scale underemployment and internal segmentation between those who end up benefiting from protection and those who do not. This pitfall is worth highlighting as several Latin American economies (such as Argentina and Chile) revise their labor codes in the context of ever-increasing globalization and expanding options for external capital (see Caballero and Hammour 1998a).

A Look at Available Evidence

We have made a theoretical argument that poor institutions generally result in a stagnant and unproductive process of creative destruction. If institutional failure is considered the fundamental illness of the developing world, sclerosis and a low-quality churn could be presumed to be prevalent. Although this presumption is consistent with the low productivity in developing countries, it would be preferable to find more direct evidence for it from job flows. At first sight the data in table 1 do not seem to support sclerosis. Job flows in the few developing countries for which we have data are similar in size to those in high-income countries—if not larger (see Tybout 2000). But there are several powerful reasons why this evidence cannot be taken at face value.

MEASUREMENT ISSUES. Lack of uniformity in job flow measures may undermine their comparability across countries. Table 1 highlights major differences in sample coverage (manufacturing, the private sector, or all employees) and the basic employer unit (the plant or the firm). Other important differences are more difficult to trace, most notably the difficulties in linking observations longitudinally in the face of

ownership or other changes. For example, Contini and Pacelli (1995) report that attempts to correct Italian data for spurious births and deaths reduce job flows by about a fifth (see Davis and Haltiwanger forthcoming, table 3.2).

INDUSTRIAL STRUCTURE AND EMPLOYER CHARACTERISTICS. The magnitude of job flows varies systematically with industrial structure and employer characteristics. Davis and Haltiwanger (forthcoming) show that the industry pattern of job reallocation intensity is quite similar across countries. A regression of reallocation on industry fixed effects (with industries classified at the two-digit level) for pooled Canadian, Dutch, and U.S. data yields an R-squared of 48 percent. Although we are not aware of any systematic investigation of this issue, we would expect to find that developing country employment is heavily biased toward light industries with relatively low investment specificity and, typically, a fast turnover rate. This type of restructuring, with small reinvestment requirements, can be expected to yield commensurately small productivity gains. Moreover, it may even be an indication that developing countries avoid industries in which restructuring is expensive, rather than a sign of their ability to restructure.

Davis and Haltiwanger (forthcoming, figure 4.1) also summarize evidence from seven countries that shows that job reallocation rates fall significantly with employer size. The bias in the size distribution in developing countries toward small plants is dramatic compared with that in high-income countries (see, for example, Tybout 2000, table 1). This bias by itself predicts much larger job flows in developing economies. The contribution to productivity by this type of reallocation requires close interpretation. If small plant size is closely related to the light-industry bias with little technological specificity, the benefits of restructuring may be small. Moreover, if small plant size is associated with greater financial fragility, some of the turnover may be privately inefficient and unproductive.

RESTRUCTURING REQUIREMENTS. Given the catching up that developing economies have ahead of them, they could be expected to have significantly higher investment and restructuring requirements than industrial economies. The extraordinary turnover rates of Taiwanese firms may be a case in point. Aw, Chen, and Roberts (1997), in their study of Taiwanese manufacturing industries, report that new entrants over the previous five years accounted for a third to a half of industry output in 1991—compared with 14–19 percent in the United States, 15–16 percent in Chile, and 18–21 percent in Colombia. The high turnover rates in Taiwan (China) suggest that absent major impediments, developing countries have the potential to attain much higher restructuring rates.

Another useful natural experiment can be found in the transition to market economies in Eastern Europe (see Haltiwanger and Vodopivec 1997). In Estonia in 1992–94 annual job creation rates averaged 9.7 percent, and annual job destruction rates 12.9 percent—within the range observed in OECD economies (see table 1). What is striking is that these rates coincided with a period of momentous reforms—Estonia, one of the most radical reformers in the region, implemented major reforms in 1992. Between 1989 and 1995 employment by private enterprises rose from 2 percent of the total to 35 percent, and the share of establishments with more than 100 employees fell

from 75 percent to 46 percent. In this context the observed job flows in Estonia were disappointingly low—not surprising, given the major institutional deficiencies faced by transition economies.

PRODUCTIVITY. So far our discussion has been limited to the volume of the churn. Our theoretical discussion pointed to factors—privately inefficient separations and scrambling in the productivity ranking of entering and exiting units—that reduce the quality of those flows. In principle, sclerosis is consistent with large flows if those flows are relatively unproductive. The quality of the churn can be measured by an accounting exercise (like that discussed in the previous section) that accounts for the aggregate productivity improvements associated with job flows. As noted in our discussion of the results of studies in Colombia and Taiwan (China), methodological issues do not allow direct comparison with results for the United States. Just as important, those studies do not account for the scrapping and reinvestment costs of restructuring. When a firm exits and is replaced by an entrant with higher productivity, the cost of scrapping investments in the exiting firm and reinvesting in the entrant needs to accounted for. This is particularly important in comparisons of high- and low-income economies, when employment in the low-income economies is biased toward light industries and other modes of production with low reinvestment costs.

*   *   *

It seems safe to conclude that cross-country comparisons based on raw job flow data are unlikely to provide conclusive evidence on the efficiency of restructuring. A more structural empirical approach is needed that addresses the types of issues discussed above. From this point of view the empirical literature is still in its infancy.

Crises, Recovery, and Productivity

Recurrent crises in developing economies have large welfare consequences. Some of these consequences are immediately apparent. Others are manifested over time and are thus often underappreciated. A potentially important example of the second type is the disruptive effect that crises can have on the restructuring process. In this section we report evidence that leads us to conjecture that crises slow restructuring. If this is true, and given our presumption of sclerosis in the production structure, crises are even costlier than their immediate impact on unemployment and other aggregate indicators might suggest.

The most noted impact of contractions on restructuring is a sharp increase in liquidations. Consider Chile's debt crisis in the early 1980s (figure 3). The job destruction rate in manufacturing exceeded 22 percent in 1981. Sharp increases in liquidations during recessions have also been documented for other countries.[8] But it would be wrong to infer that the concentration of liquidations during crises means that crises accelerate restructuring. This view was influential among pre-Keynesian "liquidationists"—such as Friedrich Hayek, Arthur Pigou, Lionel Robbins, and

Joseph Schumpeter—who saw liquidations in a positive light as the main function of recessions (see De Long 1990).

Although few economists today would take such an extreme position, many see increased factor reallocation as the "silver lining" of recessions. Liquidations are viewed as a prelude to much-needed restructuring. Under the presumption of technological sclerosis due to poor institutions, increased restructuring can be beneficial. A variety of liquidationist arguments were advanced during the Asian crisis, for example, in connection with the reorganization of Korean *chaebol*.

Although there seems to be some truth to the notion that recessions facilitate reorganization in politics and institutions, the relationship between liquidations and restructuring is much less obvious in the production structure. Jobs lost during recessions typically feed into unemployment or into underemployment in the informal sector, not directly into increased creation—the phenomenon we referred to as unbalanced restructuring. The question is whether increased liquidations ultimately lead to increased restructuring.

To address this question, one needs to examine the cumulative impact of a recessionary shock on creation and destruction—not only the effect of the crisis at impact, but also how the recovery materializes. Figure 4 shows three scenarios that are consistent with a given unemployment recession that starts with a spike in liquidations (top panel). The three scenarios correspond to cases in which the recession results cumulatively in increased, unchanged, or decreased restructuring (bottom three panels).

Figure 3. Gross Manufacturing Job Flows in Chile, 1979–85

Source: Roberts 1996, table 2.2.

We examine this question empirically in Caballero and Hammour (1999) using data from the U.S. manufacturing sector. In gross job creation and destruction time series constructed by Davis and Haltiwanger (1992) for U.S. manufacturing, there is a sharp rise in destruction at the onset of each recession, but a much more muted fall in creation (figure 5). Although this asymmetry between creation and destruction may be less strong in other sectors or when the economy is subject to different types of shocks, this evidence confirms the long-held view that liquidations are highly concentrated in recessions.

But does the evidence support increased restructuring following recessions? To examine the cumulative impact of a recessionary shock on creation and destruction, we ran a simple one-factor regression and calculated impulse-response functions (figure 6). Surprisingly, recessions seem to reduce the amount of restructuring in the economy. This finding of a "chill" following recessions is significant and robust in several dimensions, including to the introduction of a second, reallocation shock. Given the limitations of the data, our conclusion can be only tentative. But the evidence does not support the prevailing views that recessions cause increased restructuring.

Why would recessions freeze the restructuring process? Based on the model we develop in Caballero and Hammour (1999), our interpretation is that the main under-

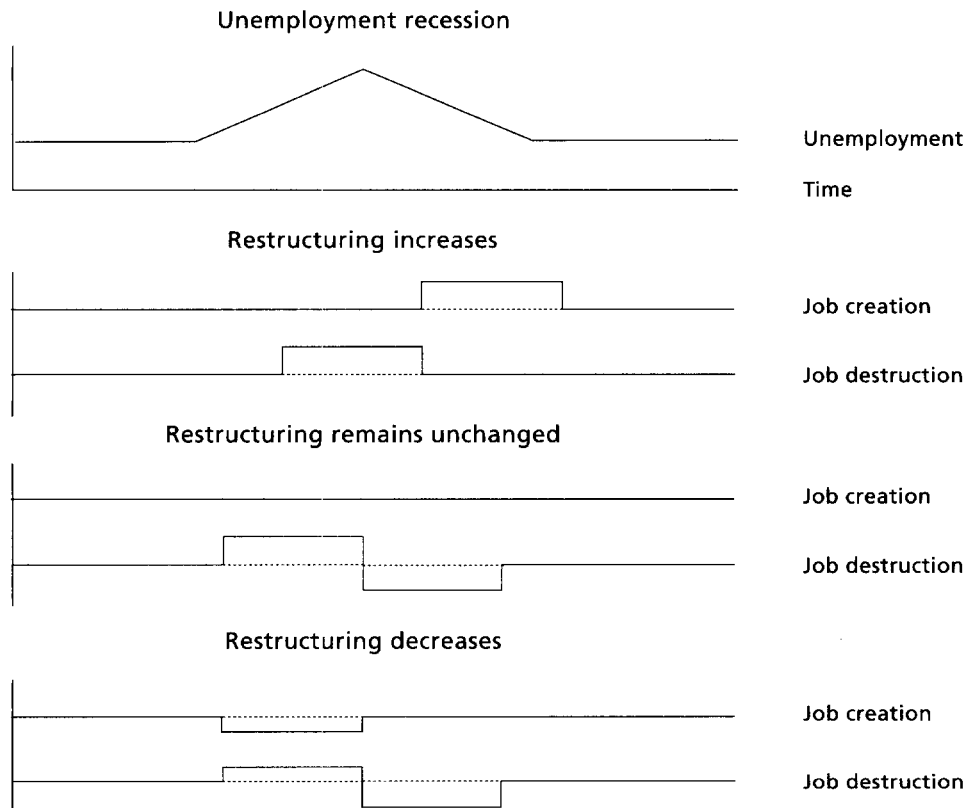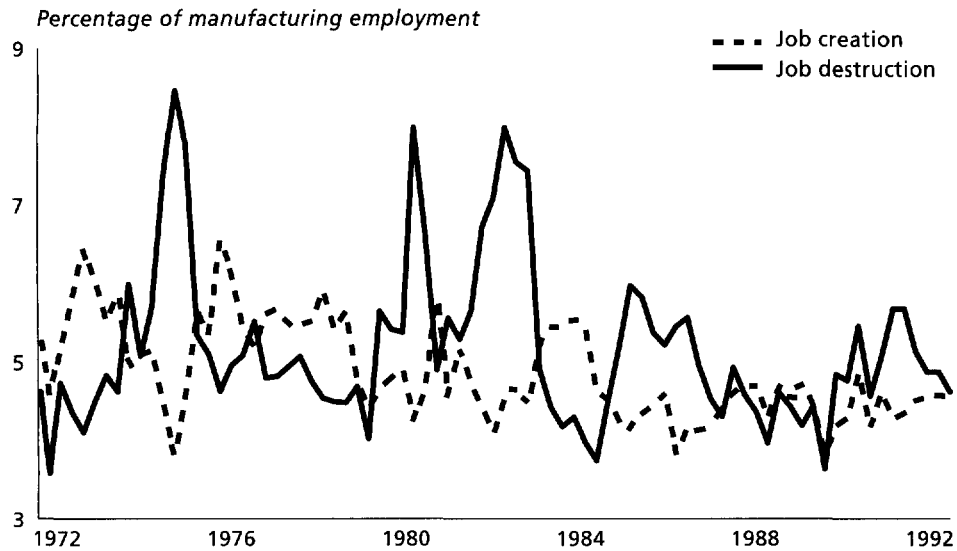### Figure 4. Cumulative Effect of Crises on Restructuring: Three Scenarios

Figure 5. Gross Manufacturing Job Flows in the United States, 1972–92

Percentage of manufacturing employment

- - - Job creation
——— Job destruction
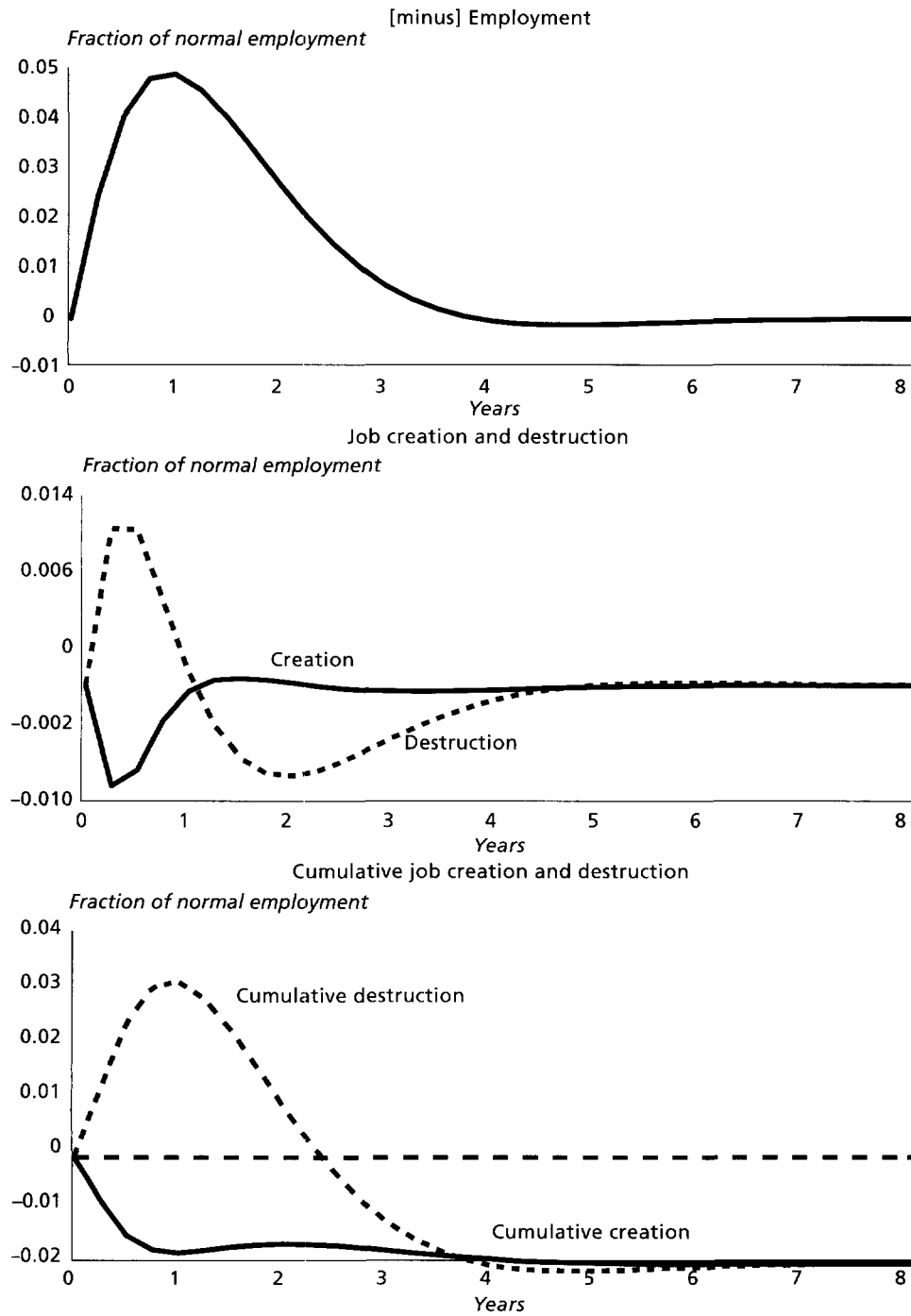
Source: http://www.bsos.umd.edu/econ/haltiwanger/download.htm.

lying factors are financial constraints—again a case of institutional failure. Liquidations and bankruptcies make the news, but recessions also squeeze the liquidity and financial resources needed to create new, more advanced production units. The competitive pressure from new production units therefore lessens, allowing low-productivity incumbents to survive more easily. The scarcity of financial resources during the recovery limits the socially useful transfer of resources from low- to high-productivity units.[9]

While lack of data preclude us from reproducing this analysis for a developing economy, it is plausible that the same phenomenon characterizes crises in developing economies.[10] The liquidity contractions in those economies are more marked, however, and their depressing effect on creation during the recovery is likely to be even stronger. In Argentina and Mexico, for example, a severe credit crunch followed the "tequila" crisis of the mid-1990s (figure 7). Loans to the private sector not only recovered very gradually after the crisis, but did so more slowly than deposits.[11]

Thus even though direct evidence is lacking, it is likely that crises constitute another major obstacle to a well-functioning restructuring process and that this disruption is closely associated with problems in financial markets. The result is a productivity-based social cost of economic crises that is in addition to the traditional cost from underemployment of labor and underutilization of other resources. The cost of crises in terms of restructuring is twofold: Crises are likely to result in a significant amount of privately inefficient liquidations, leading to large costs in job losses and liquidations of organizational capital. And they are likely to result in a freezing of the restructuring process and years of stagnation in productivity.

Figure 6. Impulse-Response Functions for a Recessionary Shock: A Case of Chill

[minus] Employment

Fraction of normal employment

Job creation and destruction

Fraction of normal employment

Cumulative job creation and destruction

Fraction of normal employment

Note: The regression underlying the figure uses U.S. manufacturing employment (Nt), gross job creation (Ht), and gross job destruction (Dt) in deviation from their mean. The data are quarterly and cover 1972–93. Employment fluctuations are assumed to be driven by a single aggregate shock. Given the identity $DNt = Ht - Dt$, a linear time-series model for the response of job flows to aggregate shocks can generally be written in terms of either creation, $Ht = qh(L)Nt + eht$, or destruction, $Dt = qd(L)Nt + edt$, where $qh(L)$ and $qd(L)$ are polynomials in the lag operator L. The figure shows the estimated impulse-response functions for a two-standard-deviation recessionary shock.
Source: Caballero and Hammour 1999.

Figure 7. Private Deposits and Loans in Argentina and Mexico, 1990s

Billions of 1995 pesos　　　　Mexico
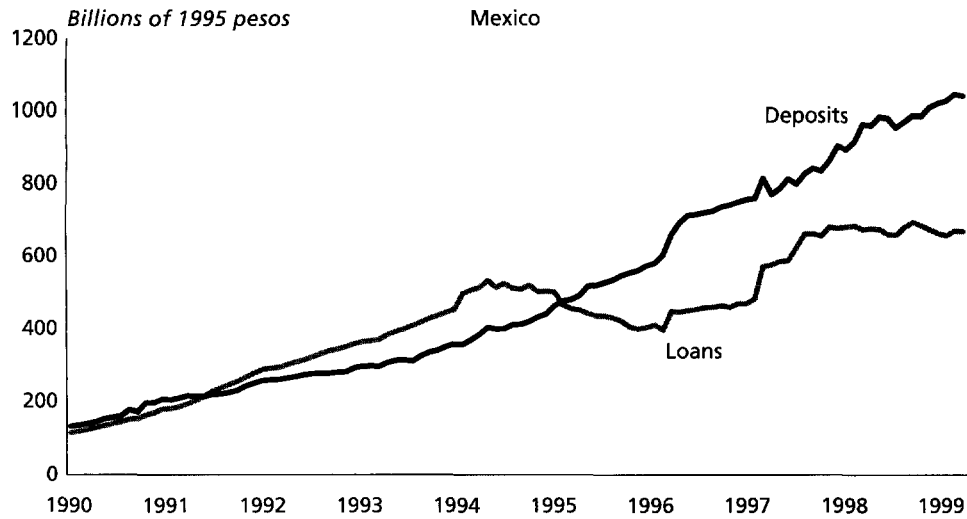
Source: Banco de Mexico.

Billions of 1995 pesos　　　　Argentina
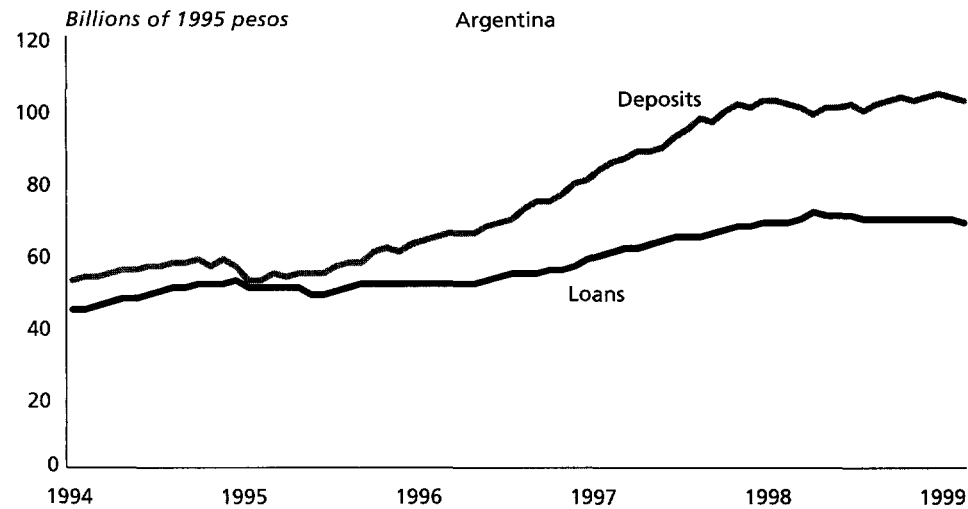
Source: Banco Central de la Republica Argentina.

Conclusion

The massive, ongoing restructuring and factor reallocation by which new technologies replace the old is a core mechanism of economic growth in modern market economies. This process of Schumpeterian creative destruction permeates major aspects of macroeconomic performance—not only long-run growth, but also economic fluctuations and the functioning of factor markets. The process of creative destruction is also fragile, exposed as it is to political short-sightedness, inadequate contractual environments, and financial underdevelopment.

We have reviewed both theoretical arguments and empirical evidence for this creative destruction view of macroeconomic performance. While the evidence we have presented is mostly from developed economies, it is no great leap to conjecture that many of our empirical findings also apply to developing economies. In fact, these economies typically suffer from more severe deficiencies in their contractual environment and from more severe damage to their financial systems during crises—the two most important factors underlying sclerosis as well as inefficient restructuring following contractions.

There is clearly a significant need for new and more structural empirical evidence on the workings of the creative destruction process and its perils in developing economies. We hope that this article has pointed to some of the most promising issues on this agenda.

Notes

1. An alternative empirical approach to creative destruction focuses on physical capital and asks how much of the growth in output is associated with capital-embodied technological progress (see Hulten 1992 and Greenwood, Herkowitz, and Krusell 1997).

2. To be more precise, Aw, Chen, and Roberts use firm- rather than plant-level data and construct a within-firm rather than a within-plant term.

3. Since Aw, Chen, and Roberts (1997) do not provide sector weights, the calculated average contribution gives equal weight to the total factor productivity growth rates in their table 12.

4. One reason for this joint negotiation could be that the entrepreneur can disguise his own funds as coming from external financiers and external funds as being his own.

5. To avoid issues relating to the possibility that the entrepreneur may want to start over in a new production unit, we assume that entrepreneurs in preexisting units have zero net worth.

6. Banerjee and Newman (1998) apply a similar interpretation to the traditional sector, which they see as having easier contracting because information asymmetries are less severe.

7. Note that equation 9 implies that $\pi_i > 0$.

8. See Davis, Haltiwanger, and Schuh (1996) for evidence from U.S. manufacturing. Where analyses have been conducted, they have shown that a large share of destruction during contractions is permanent (see Davis and Haltiwanger 1992).

9. Fluctuations in the pace of restructuring can be approached from a very different angle, by moving from job reallocation to the restructuring of corporate assets. Looking at merger and acquisition activity over time and at its institutional underpinnings, we reach a conclusion that also amounts to a rejection of the liquidationist perspective (see Caballero and Hammour 2000). Essentially, liquidationism in this context would consider fire sales during sharp liquidity contractions as the occasion for intense restructuring of corporate assets. The evidence points, on the contrary, to briskly expansionary periods characterized by high stock market valuations and abundant liquidity as the occasion for intense merger and acquisition activity. Again, financial factors and their institutional underpinnings seem to be at the core of this restructuring phenomenon.

10. It would probably be unwise to look for direct evidence of depressed reallocation along the lines that we use for the United States. The reason is that crises in developing economies often involve large changes in relative prices (such as the large real devaluation during Mexico's tequila crisis), which naturally induce reallocation. The right metric is then one that controls for this purely neoclassical mechanism.

11. The slow recovery of loans in Argentina was caused by the government's crowding out as it borrowed to pay for its monetary intervention and, most important for our argument, by the sharp consolidation in the banking sector following the crisis.

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