

Bilateral and Multilateral Aid as a Source of Capital for Electric Utility Projects in Developing and Less Developed Countries, 1950-2001

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Introduction

One of the defining characteristics of the electric utility industry always has been its extraordinary capital intensity. This in turn has meant that outside financing is essential; an electric utility cannot be financed from retained earnings. From the earliest days of the industry in the late 1870s to contemporary times, the necessity of raising an adequate supply of new capital has been a central concern and constant necessity for electric utilities, especially in areas of the world that are under served.¹ From the 1870s to the 1930s multinational enterprises, first the electrical manufacturers and their satellite firms, and then electric utility holding companies and a wide variety of other intermediaries, raised a substantial amount of capital to invest in electric utilities in the developing and less developed areas of the world, including colonial dependencies.² These were areas where domestic capital simply was inadequate to finance electric utilities, even in the largest cities. Multinational enterprises and international finance played a crucial role in expanding access to electric power in urban areas around the world in the late nineteenth and early twentieth centuries. But these sources of capital were not sustained through the political and economic difficulties of the middle third of the twentieth century.

¹ The International Bank for Reconstruction and Development (World Bank) estimates that developing countries will need an annual investment for electricity supply of \$US165 billion per year to 2010 and that this will rise by 3% per annum in the future. Accessed 14 July 2008, <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTENERGY2/0,,contentMDK:21456537~menuPK:4140735~pagePK:210058~piPK:210062~theSitePK:4114200,00.html>

² There also were many cross-border investments in the developed world. For an extensive discussion of the actors involved in multinational enterprise and international finance of electric utilities, see William J. Hausman, Peter Hertner, and Mira Wilkins, *Global Electrification: Multinational Enterprise and International Finance in the History of Light and Power, 1878-2007*, New York: Cambridge University Press, 2008, Ch. 2.

Among their other effects, the Great Depression of the 1930s and World War II seriously disrupted the flow of international capital to the electric utility industry. Furthermore, by the late 1940s electricity was seen by most to be a necessity of modern life, rather than a luxury, and foreign ownership of such an essential service was viewed skeptically by political decision makers. Tensions among owners, customers, workers, and governments, at the local, regional, and national levels, existed and were exacerbated over time. Although there were exceptions in some countries, new foreign capital stopped flowing to the industry, and extant foreign capital either was voluntarily withdrawn (through domestic buy-outs, for example) or was confiscated (nationalized) by governments. Almost all electric utilities in every part of the world by the mid-1970s had become “domestic” firms; that is, they became owned by domestic investors or by governments.³

As electric utilities became almost entirely domestic in the post-World War II era, the need for a constant supply of additional capital did not abate. Infrastructure had to be rebuilt in the immediate aftermath of the war, and attracting capital remained an especially serious problem in less developed and developing countries, including what became former colonies. Several institutions were created in the immediate aftermath of the war to begin dealing with this problem. These were multilateral organizations, with the more developed countries, particularly the United States, contributing (or using their credit to guarantee) the bulk of available capital. Over time other multilateral development agencies were created. In addition, governments in developed countries began contributing to electrical infrastructure investment by providing a substantial amount of bilateral aid.⁴ This aid sometimes was related to Cold War policies.

As soon as large domestic, often government owned, electric utilities in developing and less developed countries became the norm, the political winds shifted again. Beginning in the 1980s and accelerating in the 1990s, a privatization, liberalization, and restructuring movement (part of the so-called “Washington Consensus”) gained world-wide momentum, and multinational enterprise investment in

³ For a summary of the domestication pattern, see Hausman, Hertner, and Wilkins, *Global Electrification*, Table, 1.4. pp. 31-33, and Ch. 6.

⁴ For a list of contemporary multilateral and bilateral aid agencies, see William Easterly and Tobias Pfitze, “Where Does the Money Go? Best and Worst Practices in Foreign Aid,” *Journal of Economic Perspectives*, 22 (Spring 2008), 29-52.

the electric utility sector revived.⁵ Many of the multilateral agencies created in the post-World War II era both welcomed and fostered this development, since it offered new and potentially productive outlets for their lending.⁶ But privatization, liberalization, and restructuring turned out not to be a panacea, and in yet another political gyration, the early 2000s came to be viewed as “a period of disappointment with private sector participation in infrastructure in the developing world.”⁷

In this paper, we will describe global multilateral and bilateral electrification aid in the last half of the twentieth century, with a particular focus on the period from 1970 to roughly 2000, where the data are most readily available and reliable. We will document trends in the level of aid and will identify the largest donors and recipients of such aid. Finally, we will aggregate the data by country and decade and estimate an econometric model to see if we can explain the pattern of electrification aid across countries and time. The data on which this paper is based come from the Project-Level Aid Database (PLAID), an ambitious project “to collect and standardize data on every individual assistance project committed since 1970.”⁸ Aid projects include grants, mixed loans and grants, loans at discretionary rates from multilateral organizations, loans or loan guarantees at market rates, technical assistance, and sector aid program transfers in cash or in kind. A search of the several hundred thousands of observations in the database

⁵ There is a large literature on the Washington Consensus. See, for example, John Williamson, “Democracy and the ‘Washington Consensus,’” *World Development*, 21 (August 1993), 1329-36, and Charles Gore, “The Rise and Fall of the Washington Consensus as a Paradigm for Developing Countries,” *World Development*, 28 (May 2000), 789-804. On the revival of foreign direct investment in electric utilities, see Hausman, Hertner, and Wilkins, *Global Electrification*, Ch. 7.

⁶ Fernando Manibog, Rafael Dominquez, and Stephan Wegner, *Power for Development: A Review of the World Bank Group’s Experience with Private Participation in the Electricity Sector*, Washington, D.C.: World Bank, 2003; John E. Besant-Jones, *Reforming Power Markets in Developing Countries: What Have We Learned?* World Bank, Energy and Mining Sector Board Discussion Paper No. 19, Sept. 2006, accessed 25 July 2008, <http://siteresources.worldbank.org/INTENERGY/Resources/Energy19.pdf>.

⁷ World Bank, *Infrastructure at the Crossroads: Lessons from Twenty Years of World Bank Experience*, Washington, D.C.: World Bank, 2006, p. 2.

⁸ Robert L. Hicks, Bradley C. Parks, J. Timmons Roberts, and Michael J. Tierney, *Greening Aid? Understanding the Environmental Impact of Development Assistance*, Oxford: Oxford University Press, 2008, p. 265. The PLAID database covers approximately 90 percent of development aid projects from 1970-2000. Military aid, private long-term capital, and foreign direct investment are excluded, as is aid from the former Soviet Union. The data rely heavily on the Organization for Economic Cooperation and Development’s Creditor Reporting System but also contains data collected from donor sources. Hicks, et al., *Greening*, p. 267. For additional detail, see the project’s web page, url <http://irtheoryandpractice.wm.edu/projects/plaid/about.php> (accessed 22 July 2008). The project recently has received funding from the Bill & Melinda Gates and the Hewlett-Packard Foundations.

resulted in the identification 3,745 electrification aid projects between 1970 and 2001.⁹ All figures and tables in this paper are constructed from this database.

The Role of the World Bank in Particular and Other Large Multilateral Aid Donors

Table 1 (below) lists the largest multilateral aid agencies in terms of their support for identified electrification projects from 1970 to 2001. The three largest organizations were the World Bank group, the Inter-American Development Bank group, and the Asian Development Bank group, together contributing over 95% of total electrification aid by multilateral organizations. Since it is the largest overall development organization, and one whose policies often set trends, a brief look at the history of the World Bank will shed light on trends in infrastructure (particularly electrification) development aid.

Table 1. Multilateral Organizations, with Cumulative Electrification Aid, 1970-2001 (millions of constant 2000 \$US) and Year Founded

Inter-American Development Bank (IDB) - 1959	\$14,780
Int'l Bank for Reconstruction and Development - World Bank (IBRD) - 1945	12,117
International Finance Corp. - World Bank group (IFC) - 1956	2,345
Asian Development Fund - Asian Development Bank group (ADF) - 1974	1,982
International Development Association - World Bank group (IDA) - 1960	1,144
European Investment Bank (EIB) - 1958	633
Asian Development Bank (ADB) - 1966	384
European Bank for Reconstruction and Development (EBRD) - 1990	348
Global Environmental Facility (GEF) - 1990	197
Caribbean Development Bank (CDB) - 1969	67
Multilateral Investment Guaranty Agency- World Bank group (MIGA) - 1988	35
Nordic Investment Bank (NIB) - 1976	27
Nordic Development Fund (NDF) - 1989	21
Inter-American Investment Corporation - IDB group - 1986	19
Multilateral Investment Fund - IDB group - 1993	12
Total	\$34,111

The International Bank for Reconstruction and Development (IBRD, or World Bank) led the way in providing infrastructure investments in the immediate aftermath of

⁹ We would like to thank particularly Rob Hicks, Associate Professor of Economics at William & Mary, for making the data available, for conducting the search, and for putting the data in a manageable form. We checked every entry where “elect” appeared in project description fields. If a single project received aid in two periods, it was counted in both of those periods. We assume that any projects we missed using this procedure are randomly distributed.

World War II. Articles of Agreement for the IBRD and International Monetary Fund (IMF) were drawn up in July 1944 at Bretton Woods, New Hampshire.¹⁰ They became effective at the end of December 1945 when 28 governments signed the Articles in Washington, D.C., but it took nearly a year and a half to get the Bank organized. The first World Bank loan was a \$250 million (roughly \$2 billion in 2000 \$US) reconstruction loan made to Credit National of France in May 1947. Reconstruction loans to the Netherlands, Denmark, and Luxembourg quickly followed. The first explicit development loans for electrification by the Bank were made in March 1948 to two government-owned Chilean utilities, Fomento (\$13.5 million) and Endesa (\$2.5 million).¹¹

The primary purpose of World Bank (specifically, IBRD) loans, as specified in its charter, was to assist in the recovery and economic development of member countries. Technically, IBRD loans are sovereign obligations: “The IBRD makes loans either to a member country or governmental authorities or enterprises in the territories of member countries. A loan that is not made directly to the member country must be guaranteed by the member country.”¹² The IBRD tended initially to focus on development projects in middle-income countries because of their potential ability to pay. In 1960 a second component of the World Bank, the International Development Association (IDA) was created to make subsidized loans and grants (interest-free credits) to a group of countries, primarily in Africa and South Asia, with very low per-capita GDP. Although the IBRD and IDA maintain separate accounts, they operate as a single agency with a shared staff and shared policies. The “World Bank group” gained three other components that are smaller and have greater administrative separation. The International Finance Corporation (IFC), created in 1956, invests in private sector institutions, the Multilateral Investment Guarantee Agency (MIGA), created in 1988, insures private investors against

¹⁰ According to Alec Cairncross, the discussions regarding creation of the IMF were the more contentious of the two, “Yet in the first ten years of its existence it was the Bank rather than the Fund which most readily found a place for itself.” Alec Cairncross, *The International Bank for Reconstruction and Development*, Essays in International Finance, No. 33, International Finance Section, Department of Economics and Sociology, Princeton University, March 1959, p. 3. Cairncross states that the main task of the bank was “to stimulate and support foreign investment” but “not to supersede it.” pp. 5, 27.

¹¹ See the historical chronology, World Bank web site (<http://www.worldbank.org/> accessed 15 July 2008).

¹² World Bank, “IBRD Financial Products, Frequently Asked Questions,” updated 5 September 2005, p. 7, accessed 21 July 2008, http://treasury.worldbank.org/web/pdf/faq_ibrd_fin_prod.pdf.

expropriation and other risks in developing countries, and the International Centre for the Settlement of Investment Disputes (ICSID), created in 1966, provides facilities for the settlement and arbitration of international investment disputes between member countries and individual investors.¹³ In addition to its lending functions, the Bank also developed technical and administrative expertise and devoted significant resources to research on development issues. This has enabled it to act as a consulting firm advising member countries on issues related to specific projects and on the relationship between public policies and economic development.¹⁴

The policies of the World Bank have changed over time. These policy changes have arisen largely because of developments in three related areas: 1) changes in knowledge about how an external agency can best foster economic development in a country; 2) changes in the willingness of private lenders to provide funds to developing country governments and private companies; and 3) changes in theories about the best institutional structure for public utilities. This last factor has been particularly applicable to Bank support of electric power projects.¹⁵

During its first 25 years, the Bank was primarily engaged in identifying and funding specific projects where the expected economic return exceeded the project's cost. These were projects unable to secure private funds because the project duration was so long or because the risk premium required by private lenders made the interest rate on borrowed funds uneconomically high. These frequently were large infrastructure projects, including hydroelectric and other power projects. In this mode, the Bank played a role very similar to a commercial bank operating in an area of capital market imperfections.¹⁶

Between 1949 and 1982 the World Bank committed a total of \$17.8 billion to 413 electric power projects in 86 countries. This represented 17% of its total commitments,

¹³ See C.L. Gilbert and David Vines, *The World Bank: Structure and Policies*, New York: Cambridge University Press, 2000, pp. 10-17; Michelle Miller-Adams, *The World Bank: New Agendas in a Changing World*, New York: Routledge, 1999, pp. 34-42; and Anne C.M. Salda, *Historical Dictionary of the World Bank*, Lanham, Md.: Scarecrow Press, 1997, pp. xv, 1-6, 106-9.

¹⁴ Gilbert and Vines, *World Bank*, pp. 17-30.

¹⁵ As the 2007 *Global Monitoring Report* stated, "All IFIs [international financial institutions] are constantly adapting their strategies to respond to new demands and the changing external environment.... The World Bank and the regional development banks have devoted considerable attention to clarifying roles and determining priorities." World Bank, *Global Monitoring Report 2007*, Washington, D.C.: World Bank, 2007, p. 187.

¹⁶ Gilbert and Vines, *World Bank*, pp. 14-15.

exceeded only by the Bank's lending to agriculture (25%) and transportation (18%). Of these commitments, 39% went to Asian countries and 37% to Latin American countries, with the remainder scattered among other countries around the world.¹⁷ The need for such aid was perceived to be so obvious by the early 1980s that the Bank felt no particular need to explain itself: "Since electric power is a universal requirement for economic development, no special explanation is needed for the wide spread of the Bank's power lending."¹⁸ The Bank also was not as prescriptive as it would become later regarding the structure of the industry. In the early 1980s it believed that there were "no generally agreed best methods of organizing a country's power sector."¹⁹ The Bank soon would change its view.

The creation of the IDA in 1960 had begun a shift in the Bank away from traditional banking toward being more of a development agency. This change was accelerated during the presidency of Robert McNamara (1968-1981). McNamara not only envisioned the Bank primarily as a development agency, but also wanted the bank to focus more specifically on alleviating poverty. The traditional activities of the Bank had become increasingly subject to criticism. One criticism was that the funds provided by the Bank were fungible by the recipient country and were effectively not used for designated projects. Projects identified as having the highest economic returns, and therefore receiving Bank support, would have been supported in the absence the Bank. Support from the World Bank allowed the recipient country to re-channel the funds that would have gone to the supported project to some other activity. Thus the marginal effect of the Bank's funding was the return on that other activity, not the targeted project. In addition, critics claimed that the Bank's activities aggravated income disparities in recipient countries and possibly resulted in an absolute decline of the well-being of the poorest in the population. Finally, there began to be vigorous complaints about the environmental effects of the Bank's projects.²⁰

¹⁷ Hugh Collier, *Developing Electric Power: Thirty Years of World Bank Experience*, Baltimore: Johns Hopkins University Press, 1984, 19.

¹⁸ Collier, *Developing Electric Power*, 19.

¹⁹ Collier, *Developing Electric Power*, 12.

²⁰ Gilbert and Vines, *World Bank*, pp. 196-209; Salda, *Historical Dictionary*, pp.6-10, 106-09. Daniel L. Nielson and Michael J. Tierney, "Delegation to International Organizations: Agency Theory and World Bank Environmental Reform," *International Organizations*, 57 (Spring 2003), 241-76. On McNamara's

Following the oil shocks and inflation of the 1970s, the Bank in 1980 began offering structural loans designed to enable countries that had embarked on policy reforms to handle their current account deficits. This was part of the movement from support for individual projects to country-oriented lending.²¹ During this time, as private sector funds to developing country governments essentially became unavailable, the Bank became increasingly involved in preventing default by helping countries restructure their debt by lending the countries money to pay interest. The important point for infrastructure investment was that these loans usually had conditions attached that sought micro-economic reforms. By this time electricity was being provided in most developing and less developed countries by government-owned monopolies. Power sectors accounted for a large (up to one-third) share of public investment and accounted for a significant proportion of public debt. In the 1980s the Bank provided about 7% of the financing for power investments in developing countries and also aided these countries in obtaining additional financing for power projects. The conditions made by the Bank encouraged countries to adopt marginal-cost pricing, employ least-cost planning techniques, insulate management from political pressures, use international bidding, and adopt international accounting standards, among others. A few countries became ineligible for future financing because of their failure to adopt agreed-to standards. The Bank clearly joined the side of privatization and restructuring the electric utility sector by the end of the decade. As one policy paper stated, “The Bank will aggressively pursue the commercialization and corporatization of, and private sector participation in, developing-country power sectors.”²² These policies were reflected in the policies of other multilateral aid organizations.²³

As external private investments, including direct foreign investment, private debt, and portfolio equity investment, soared in the 1990s, a number of middle income

policies see David Milobsky and Louis Galambos, “The McNamara Bank and Its Legacy, 1968-1987,” *Business and Economic History*, 24 (Winter 1995), 167-95

²¹ Milobsky and Galambos, “The McNamara Legacy,” pp. 174-75.

²² World Bank, *The World Bank's Role in the Electric Power Sector: Policies for Effective Institutional, Regulatory, and Financial Reform*, Washington, D.C.: World Bank, 1993, p. 16. Also see Salda, *Historical Dictionary*, pp. 71-74.

²³ For example, the Inter-American Development Bank (IDB) created a Private Sector Development Program in 1990. IDB web site; accessed 21 July 2008, url http://www.iadb.org/aboutus/1/hi_historical.cfm?language=English#.

countries experienced rapid economic growth and came to be referred to as “emerging markets.”²⁴ The level of private funds supporting infrastructure projects also was large, reaching 53% of total infrastructure in developing countries, and some began to question whether the capital market failures that justified the Bank’s original support for these activities still existed. The Bank’s relative support for all infrastructure projects, as well as energy projects, was reduced during the second half of the decade. Then in 1997 the emerging markets in Asia experienced a financial collapse, and new private investments, including infrastructure investments, were immediately and sharply reduced.²⁵ All types of foreign investment rebounded in 2002-03, but World Bank energy infrastructure projects continued to decline as a percent of the Bank’s total commitments.²⁶ We have demonstrated clearly in this historical sketch that during the period 1970-2000 there were considerable fluctuations in the Bank’s lending practices and policies. This gives us something to explain.

Bilateral Aid Donors

In addition to multilateral aid organizations, bilateral electrification aid also played an important role in the post-World War II era. In fact, cumulative bilateral aid exceeded multilateral aid by almost 40%. Table 2 (below) lists the largest bilateral donors from 1970 to 2001, with cumulative aid in constant U.S. dollars. Bilateral aid provision also is highly concentrated, with the top seven donors contributing over 90% of total bilateral aid. Japan was by far the largest donor, contributing over 40% of bilateral electrification aid, encompassing 419 projects in 59 countries.²⁷ European nations also contributed substantially. The United States, which was a major donor to multilateral agencies, was fifth on the list of bilateral donors. For the United States, some of this aid was based on the lessons of European reconstruction and emanated from the Cold War conflict: “US government involvement in Asian electricity grew out of postwar

²⁴ World Bank, *Global Monitoring Report 2007*, p. 196.

²⁵ The largest reductions came in private debt and portfolio equity investments; foreign direct investment abruptly leveled off but did not decline. World Bank, *Global Monitoring Report 2007*, p. 196; World Bank, *Infrastructure at the Crossroads*, p. 4

²⁶ World Bank, *Infrastructure at the Crossroads*, pp. 4-5.

²⁷ On Japanese aid up to the late 1980s, see Martin Rudner, “Japanese Official Development Assistance to Southeast Asia,” *Modern Asian Studies*, 23 (1989), pp. 73-116.

reconstruction. The rebuilding of war-damaged electrical grids in Europe reflected the prevailing Keynesian consensus that government should direct investment in essential infrastructure. ... The success of the state-led approach in European recovery shaped American thinking as it turned toward promoting economic development in the former colonial world as a bulwark against communism.”²⁸ The Soviet Union, although not represented in the data, also provided some assistance to developing countries, mostly in the form of technical aid, but also in support of nuclear power plants in some nations.²⁹ With the collapse of the Soviet Union there has been less political pressure for this type of aid.³⁰ On the other hand, this freed donors to pursue other objectives when distributing their aid, including the general well-being of less developed nations.

²⁸ James H. Williams and Navroz K. Dubash, “Asian Electricity Reform in Historical Perspective,” *Pacific Affairs*, 77 (Fall 2004), pp. 411-36.

²⁹ Gu Guan-Fu, “Soviet Aid to the Third World. An Analysis of its Strategy,” *Soviet Studies*, 35 (Jan. 1983), pp. 71-89. The Soviet Union agreed in 1976, for example, to assist Cuba in construction of a nuclear power plant with two reactors at Juragua in Cienfuegos province. Work began in 1983 and plans for additional reactors were made. By 2005 Cuba was scheduled to have a total of twelve reactors, but in 1993 Russia announced a \$30 million credit to Cuba to mothball the plant. Cuba still hoped to complete construction but in 1997 Fidel Castro announced yet another postponement of the project, which has not been completed. Jonathan Benjamin-Alvarado and Alexander Belkin, “Cuba’s Nuclear Power Program and Post-Cold War Pressures,” *The Nonproliferation Review* (Winter 1994), 18-26. China also provided some aid for hydroelectric projects in several less developed countries in the 1960s and 1970s. Janos Horvath, *Chinese Technology Transfer to the Third World*, New York: Praeger, 1976, pp. 8, 15.

³⁰ Regarding Africa, for example, the U.S. Congressional Research Service noted that aid to Africa had peaked in the mid-1980s due to “the global competition with the Soviet Union” but that in 1995 “substantial reductions in aid to Africa had been anticipated, as many questioned the importance of Africa to U.S. national security interests in the post-Cold War era.” Raymond W. Copson, “Africa: U.S. Foreign Assistance Issues,” Congressional Research Service, Library of Congress, CRS Issue Brief, May 20, 2003, <http://fpc.state.gov/documents/organization/21123.pdf> (accessed 28 June 2006). Total foreign official development assistance (ODA) to Africa actually peaked in 1990, fell dramatically to 2000, and then rebounded. Berhanu Abegaz, “Multilateral Development Aid for Africa,” *Economic Systems*, 29 (2005), pp. 433-54, graph at p. 435.

Table 2. Bilateral Donors, with Cumulative Electrification Aid (millions of constant 2000 \$US), 1970-2001

Japan	\$20,485
W. Germany	8,099
France	4,052
Canada	2,714
United States	2,617
UK	2,504
Italy	2,020
Sweden	1,022
Norway	811
Spain	595
Denmark	517
Austria	362
Netherlands	325
Finland	269
Australia	172
Belgium	118
Switzerland	82
New Zealand	6
Ireland	<1
Total	\$46,770

The Largest Recipients, Largest Projects, and Trend in Total Electrification Aid

Table 3 (below) lists the top twenty-four total aid recipients in the period 1970-2001, along with aid per capita. Electrification aid is naturally spread more evenly among recipients than among donors, with the top 24 countries receiving about 75% of the total. The largest total recipients of aid tended to be the countries with the largest populations, but otherwise they are spread around the world. In terms of aid per capita, there are two Asian and two South American countries at the top of the list. It is noteworthy but not surprising that Sub-Saharan Africa, the area with some of the poorest countries in the world, has only two countries on the list. The same factors that inhibit bilateral or multilateral aid (including lack of income and resources as well as rampant corruption in government-owned enterprises) almost certainly also inhibit direct foreign investment, making progress toward development all the more difficult.

Table 3. Largest Recipients of Electrification Aid (millions of constant 2000 \$US), and Aid Per Capita, 1970-2001

	total	\$ per person, 1990 population
Brazil	\$5,761	\$38.1
India	5,421	6.4
China	4,849	4.3
Indonesia	4,769	25.4
Pakistan	4,058	35.6
Colombia	3,906	118.9
Thailand	3,687	66.6
Argentina	3,308	100.2
Egypt	2,993	52.3
Sri Lanka	2,335	135.8
Mexico	2,181	25.9
Malaysia	2,146	122.6
Bangladesh	2,075	18.9
Philippines	1,906	29.6
Turkey	1,621	28.3
Nepal	1,525	78.9
Peru	1,294	58.8
Chile	1,197	91.2
Vietnam	1,142	17.1
Tanzania	1,043	40.7
Ecuador	874	84.7
Kenya	835	34.9
Iran	794	13.8
Venezuela	785	40.6
Total, 24 countries	\$60,550	
All other countries, multi-country, and unspecified	\$20,331	
total	\$80,881	

Table 4 (below) lists the ten largest projects in each of the decades, 1970s, 1980s, and 1990s. The aid projects covered virtually all aspects of electrification, including but not limited to generation, transmission, and distribution infrastructure, but the largest projects, which absorbed a substantial amount of aid funds were hydroelectric facilities and their associated networks. These thirty projects consumed nearly 15% of total electrification aid in the period. While making electricity available to many people, some of these projects turned out to be quite controversial, among them the Victoria Dam in Sri

Lanka, the Pueblo Viejo-Quixal Hydroelectric project on the Chixoy River in Guatemala, and the Yacyretá Hydroelectric project on the border between Argentina and Paraguay.³¹

Table 4. Ten Largest Electrification Aid Projects, 1970-79, 1980-89, 1990-99

1970-79

Recipient	Donor	Amount (mil \$2000)	Year	Project
Guatemala	IDB	437	1975	Pueblo Viejo-Quixal hydro project
Brazil	World Bank	411	1973	Itumbiara hydroelectric project
Sri Lanka	United Kingdom	392	1979	Victoria hydroelectric dam
Argentina	World Bank	389	1979	Yacyretá hydroelectric project
Cent. and E. Europe	W. Germany	382	1974	electrical distribution systems
Zambia	World Bank	378	1973	Kafue hydro power project, stage 2
Brazil	World Bank	289	1970	Marimbondo hydroelectric project
Argentina	IDB	287	1979	Alicurá hydroelectric project
El Salvador	IDB	267	1977	San Lorenzo hydroelectric project
Brazil	World Bank	244	1971	Salto Osorio hydro project

1980-89

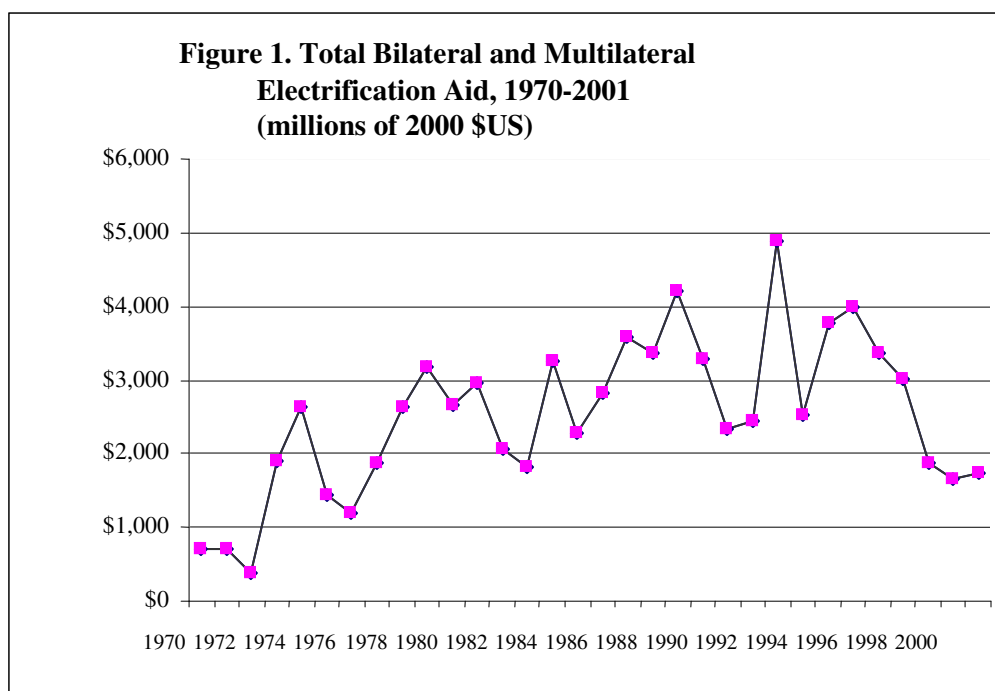
Recipient	Donor	Amount (mil \$2000)	Year	Project
Brazil	World Bank	678	1986	Electric Power Sector Loan Project
Mexico	World Bank	568	1989	hydroelectric development project
Argentina	IDB	552	1982	Piedra del Agula hydro project
Colombia	World Bank	519	1981	Guavio hydroelectric project
Chile	IDB	433	1986	Pehuenche hydroelectric plant
Turkey	World Bank	432	1987	Energy Sector Adjustment Loan Project
Colombia	World Bank	398	1987	Power Sector Adjustment Loan Project
Argentina	World Bank	327	1988	Electric Power Sector Loan Project
Argentina	IDB	324	1988	Yacyretá hydroelectric project
India	Japan	264	1988	hydroelectric power project

1990-99

Recipient	Donor	Amount (mil \$2000)	Year	Project
Venezuela	IDB	555	1993	Caruachi Central hydro project
Brazil	World Bank	453	1990	electricity transmission and conservation project
China	World Bank	434	1991	Ertan hydroelectric project
China	World Bank	433	1995	Ertan (2) hydroelectric project
Malaysia	Japan	399	1993	Port Klang power station
Brazil	IDB	396	1997	Ita hydroelectric project
Mexico	IDB	388	1990	Electrical Sector Investment Program
Iran	Japan	385	1993	Kadur River hydroelectric project
Colombia	IDB	373	1998	Electricity Sector Program
Colombia	IDB	364	1993	Porce II hydroelectric power plant

³¹ Accessed 21 July 2008, <http://www.newscientist.com/article/mg14119143.800-britains-other-dam-scandal-.html>; <http://www.centerforpoliticalecology.org/chixoy.html>; <http://www.iadb.org/iim/pr191713eng.pdf>;

Figure 1 (below) presents the aggregate annual amounts of electrification aid from 1970-2001 in constant (2000) U.S. dollars. The graph highlights the erratic fluctuations of annual support from the early 1970s to the late 1990s, and the severe reduction of support (to levels not seen in real terms since the mid-1970s) in 1999-2001. Some of this decline in aid in recent years was made up with private investment, but it is clear that bilateral and multilateral electrification aid has been somewhat erratic. Still, bilateral and multilateral aid was an important mechanism for funding electrification projects in the post-World War II era. Next we will attempt to explain the pattern of that aid across countries and decades.



An Empirical Model of the Determinants of Electrification Aid

In this section we seek to explain the pattern of multilateral and bilateral electrification aid per capita using a variety of macroeconomic and institutional variables, including Gross Domestic Product (GDP), the investment share of GDP, geographical region, and political freedom.³² We estimate both pooled time-series and cross-sectional regressions as well as a pure cross-sectional model for three decades (1970s, 1980s, and 1990s). This decadal approach is used to adjust for potential econometric problems and follows the work of Acemoglu, et al. and Alesina and Weder.³³ The basic problem is that electrification aid often is lumpy, meaning that there are some years when relatively large investments occur (say in a hydroelectric project), which then are followed by years with very little or no aid received, even though the project is on-going. The decadal approach has the advantage that it smoothes out this type of aid. In addition, for econometric reasons we use the beginning of decade data for the independent variables in the model, which mitigates endogeneity concerns.³⁴

Why do we take this approach? The relationship between aid in general and GDP growth has generated a substantial amount of interest over the last ten years in the empirical growth literature.³⁵ The purpose of this literature was to answer the question of

³² For a general model of aid using four African nations as an example, see Mark McGillivray, "What Determines African Bilateral Aid Receipts?" *Journal of International Development*, 17 (2005), pp. 1003-18.

³³ Daron Acemoglu, Simon Johnson, James Robinson, and Yunyong Thaicharoen, "Institutional Causes, Macroeconomic Symptoms: Volatility, Crises, and Growth," *Journal of Monetary Economics*, 50 (Jan. 2003), pp. 49-123, and Alberto Alesina and Beatrice Weder, "Do Corrupt Governments Receive Less Foreign Aid?," *The American Economic Review*, 92 (Sept. 2002) pp. 1126-1137.

³⁴ Endogeneity occurs when there is feedback between the independent and dependent variables; that is, when causality runs both ways. If this is a serious problem, the coefficient estimates are biased.

³⁵ See, for example, Jeffrey Sachs, *The End of Poverty*, New York: Penguin Press, 2005; Craig Burnside and David Dollar, "Aid, Policies, and Growth," *American Economic Review*, 90 (Sept. 2000), pp. 847-868; William Easterly, "Can Foreign Aid buy Growth?" *Journal of Economic Perspectives*, 17 (Summer 2003), pp. 23-48; William Easterly, Ross Levine, and David Roodman, "Aid, Policies, and Growth: Comment,"

whether aid causes growth, or, as Easterly puts it, whether aid can “buy growth.”³⁶ We fundamentally turn this equation around and ask instead whether the level of development, measured by GDP and investment share in GDP, influences electrification aid.³⁷

Another question regarding aid is whether governance matters. Institutional variables have been established as one of the fundamental determinants of growth and development in general.³⁸ Many developed countries as well as multilateral lenders such as the World Bank now try to condition their aid on standards of governance. We include the rating by Freedom House for political rights (1=best, 7=worst) as an explanatory variable. While there are other potential ratings, the Freedom House data are available for a broad set of countries since the early 1970s.³⁹ We expect the rating to be inversely related to aid (since lower ratings indicate more freedom, including economic freedom). We also use 1990s Fraser Institute ratings of the use of markets by countries as a check for that decade.⁴⁰ Finally, we include the initial decadal investment share of GDP to capture the potential benefit of an enlarging capital stock for electrification aid. As large

The American Economic Review, 94 (June 2004), pp. 774-80; A. Craig Burnside and David Dollar, *Aid, Policies, and Growth: Revisiting the Evidence* (March 18, 2004), World Bank Policy Research Working Paper No. 3251, available at SSRN: <http://ssrn.com/abstract=610292>.

³⁶ Easterly, “Can Foreign Aid buy Growth,” p. 23.

³⁷ All GDP, investment, and population data are from the Penn World Table. Alan Heston, Robert Summers, and Bettina Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006, accessed 14 July 2008, http://pwt.econ.upenn.edu/php_site/pwt62/pwt62_form.php

³⁸ Daron Acemoglu, Simon Johnson, and James Robinson, “The Colonial Origins of Comparative Development: An Empirical Investigation.” *American Economic Review*, 91 (Dec. 2001), pp. 1369-1401; Robert Hall and Charles Jones, “Why Do Some Countries Produce So Much More Output Per Worker Than Others?” *Quarterly Journal of Economics*, 114 (Feb. 1999), pp. 83-116. Neumayer defines good governance as “such things as democracy, respect for human rights, non-excessive military expenditures and the general quality of public sector management.” Eric Neumayer, *The Pattern of Aid Giving: The Impact of Good Governance on Development Assistance*, London and New York: Routledge, 2003, p. 1.

³⁹ <http://www.freedomhouse.org/uploads/FIWAllScores.xls>, accessed 14 July 2008.

⁴⁰ <http://www.freetheworld.com/papers.html>, accessed 14 July 2008. Also see Elsabé Loots, “Aid and Development in Africa: the Debate, the Challenges and the Way Forward,” *South African Journal of Economics*, 74 (Sept. 2006), pp. 363-81, who discusses the relationship between “good governance” and aid.

infrastructure projects of any kind require considerable maintenance, a higher investment share should be a good signal for donors that aid for electrification can have lasting effects.

Table 5 presents the results of our main specification estimated by ordinary least squares (OLS).⁴¹ We only include countries that received positive amounts of electrification aid in any of the decades.

Table 5. Determinants of Electrification Aid
Dependant Variable: log (Aid Per Capita)

Pooled and Decadal Regressions	1970-1999 (pooled)	1970s	1980s	1990s(1)	1990s(2)
Initial GDP per capita in logs	-0.204 (0.197)	0.147 (0.382)	0.072 (0.222)	-0.720* (0.387)	-0.744* (0.410)
Initial Investment Share in % of GDP	0.037** (0.017)	0.047 (0.028)	-0.029 (0.022)	0.065** (0.033)	0.052 (0.038)
Initial Freedom House Rating	-0.108 (0.074)	-0.052 (0.135)	-0.131 (0.090)	-0.246* (0.145)	--
Fraser Institute measure of use of markets	--	--	--	--	0.458*** (0.148)
Africa Dummy	-0.716* (0.382)	-1.678** (0.751)	-0.024 (0.453)	-0.807 (0.697)	-0.817 (0.794)
Asia Dummy	-0.515 (0.397)	-1.118 (0.719)	-0.115 (0.490)	-0.402 (0.750)	-0.254 (0.795)
Caribbean Dummy	0.846** (0.422)	1.069 (0.987)	0.410 (0.517)	1.240* (0.692)	0.939 (0.802)
R-squared	0.104	0.297	0.074	0.155	0.250
Countries	119	67	93	108	74
Observations	268	67	93	108	74

Standard Errors in parentheses. Superscripts */**/** denote 10, 5, 1 percent significance levels. A constant (not reported) was included in all regressions.

⁴¹ The specification was as follows:

$$\log(\text{aidpercapita})_{it} = \alpha + \beta_1 \log(\text{initialGDPpercapita})_{it} + \beta_2 (\text{initialFreedomHouse})_{it} + \beta_3 (\text{investmentshare})_{it} + \gamma X_{it} + \varepsilon$$

where X is a matrix of additional control dummies for Africa, Asia, and the Caribbean island countries.

Note that for the pooled data covering all three decades (the first column of results) the investment share has the correct positive sign and is statistically significant at the 5 percent level. Caribbean countries received statistically significantly more aid per capita, whereas African countries receive less. The Freedom House measure for political freedom is not statistically significant although it has the correct negative sign. In the decadal regressions the results change. The point estimate of the Freedom House measure becomes more negative and is statistically significant at the 10 percent level in the 1990s, indicating that donors may have been rewarding countries with more political freedom and open markets. While Alesina and Weder did not find a statistically significant effect of corruption on overall aid, political governance does appear to matter for electrification aid, especially in the 1990s. The 1990s also are the only decade where the investment share is positive and statistically significant. The coefficient on GDP per capita is negative and statistically significant for the 1990s, indicating that poorer countries received more aid per capita in that decade. This may have been a reflection of the changing policies of the World Bank and other multilateral and bilateral donors or may have been related to the availability of private international finance in higher-income countries. To summarize, electrification aid in the 1990s seems to have moved towards poorer countries with better governance and a greater existing stock of capital, *ceteris paribus*. In terms of the regional patterns of the 1990s, African countries, when controlling for the variables in the model, did not receive less aid compared to countries in Asia and South America; the only statistically significant region dummy is the one for Caribbean countries, which received greater aid per capita than other regions.

As an alternative test of the political variable we introduced a second measure of the use of markets in the economy (0=least, 10=most) published by the Fraser Institute.⁴² Insufficient country coverage prior to 1990 prevents us from estimating decadal regressions for the 1970s and 1980s. The estimated coefficient, which we hypothesize should have a positive sign, is statistically significant in the 1990s at the 1 percent level and is also quite large in magnitude. A two point increase in the index (for example, the difference between India at 3.5 and Turkey at 5.4), more than doubles predicted aid per capita, *ceteris paribus*. Overall, more recent (1990s) electrification aid appeared to move marginally toward countries that can make better use of it (in terms of political freedom, the role of markets, and available capital). This is an important result and differs from some of the recent findings for aid in general.⁴³

Conclusion

In this paper we have drawn on a unique dataset to extract and compile information on multilateral and bilateral electrification aid projects from 1970-2001. We aggregated and presented information on the largest donors and recipients and the largest projects over the period. We also looked at trends in total aid, adjusted for inflation, over the period. We concluded, not surprisingly, that donors tended to be more concentrated than recipients and particularly that there were a relatively small number of large and influential multilateral donors. These donors were capable of substantially influencing

⁴² The ratings are for “Structure of the Economy and Use of Markets—Production and Allocation via Political Mandates Rather Than Private Enterprises and Markets,” from James Gwartney and Robert Lawson, with Dexter Samida, *Economic Freedom of the World 2000, Annual Report*, The Fraser Institute, accessed 15 July 2008, http://oldfraser.lexi.net/publications/books/econ_free_2000/.

⁴³ See, for example, Alesina and Weder, “Do Corrupt Governments,” and Easterly and Pfutze, “Where Does the Money Go?”

overall policy. We examined the history of World Bank policies toward aid to the electric utility sector, and noted that policy clearly shifted from supporting large infrastructure projects of vertically-integrated, government-owned utilities, to support for liberalization, privatization, and restructuring of the industry. The World Bank clearly was a proponent of the Washington Consensus from the mid-1980s onward, although this “consensus” has weakened substantially in the last few years. Real aggregate electrification aid fluctuated annually (which is not really surprising given that such infrastructure aid can be “lumpy”), with an upward trend from the mid-1970s to 1990. Between 1990 and 2001 there were serious annual fluctuations, with aid falling to mid-1970s level by 1999. One by-product of the liberalization, privatization, and restructuring movement (aided, of course, by the collapse of the Soviet Union) was an increase in foreign direct and foreign portfolio investment in the electric utility sector during the 1990s.

In the final section, we specified a model that sought to explain electrification aid, aggregated over the decades of the 1970s, 1980s, and 1990s, using various macroeconomic, institutional, and geographic variables. We believe that this is the first attempt to estimate such a model for electrification aid.⁴⁴ We could explain between seven and thirty percent of the variation in electrification aid using the variables in the model. In many ways the results for the 1990s were most interesting. There was evidence of a shift of electrification aid to countries with lower GDP per capita, and toward countries with better governance structures or more open markets, with some evidence that aid was directed toward countries with a higher investment share of GDP, evidence

⁴⁴ Neumayer, *The Pattern of Aid Giving*, pp. 21-29, summarizes the models estimated and results of 43 multivariable regression studies of aid conducted between 1971 and 2003, none of which were on electrification aid.

of a greater ability to pay. The results on political or economic freedom are at odds with some of the recent studies of overall aid and warrant further examination.