Robert S. McNamara
Fellowships Program

Tenth Anniversary Publication
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Economic Development Institute
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Foreword

In April 1982 the Executive Directors of the World Bank passed a resolution establishing the Robert S. McNamara Fellowships Program to honor the former President of the Bank. The purpose of the Program was to promote imaginative and innovative research on issues related to economic development. Since Fellows were required to spend the Fellowship period in a World Bank member country other than their own, the Program also hoped to foster greater international understanding of the development process. Thus, the Program hoped to reflect the broad vision of development that Robert McNamara had brought to the Bank.

Mr. McNamara's seventy-fifth birthday in June 1991 coincided with the start of the tenth anniversary of the Program; it was therefore deemed fitting that these two events be honored. The result is this publication.

Since his retirement from the Bank in 1982, Mr. McNamara has maintained a strong interest in economic development, especially in connection with disarmament and Africa. The first article in this publication provides an insight into his thinking on these subjects in the last ten years.

The bulk of the publication is devoted to the research results submitted by eight of the Fellows. Although the subject matter varies, and is indeed unconnected to either of the interests of Mr. McNamara as expressed in the introductory article, the thread of economic development runs through them all.

Our intention is not only to honor Mr. McNamara and the Fellowships Program established in his name; we also hope that this publication will stimulate the interest of institutions and individuals in developing countries, and encourage them to apply for Fellowships. To this end, the remainder of the publication contains what is essentially an annual report, with information on the background and current state of the Program.

The Secretariat of the McNamara Fellowships Program wishes to congratulate Mr. McNamara on his seventy-fifth birthday and thank all those who have supported the Program during the last ten years.

Robert S. McNamara's Vision

In the best of all worlds, nations would live in peace and the vast sums once spent for war would underwrite development. Former World Bank President Robert S. McNamara sees the end of the Cold War as an unparalleled opportunity to realize this vision. He calls on the World's leaders to seize the moment, to free the world from conflict and allow the people of the developing world to lead a decent life. The fall of the Berlin Wall marked the end of an era. With the outline of the next not yet drawn, Mr. McNamara focuses on the connection between collective security, disarmament and development. He stresses in an interview: "Today, we have a very fluid situation, without the constraints of the Cold War that for forty-five years have limited our freedom to deal with national and international issues. We have to take advantage of this to address some very basic human problems."

The statistics he offers are enlightening. In 1988, for example, developing nations spent more than $170 billion on weapons and military activities, more than four percent of their total GNP. By some estimates, that is only slightly less than the amount these governments spend on health and education. The picture painted by this imbalance is particularly grim for Africa, where living standards and life expectancy are already among the lowest in the world. According to the United Nations Food and Agricultural Organization (FAO), at least thirty million Africans are currently facing severe malnutrition and death by starvation. It is no coincidence, FAO officials point out, that the African nations facing the worst food shortages have all been fighting civil wars.

Only peace and security promise an end to famine and poverty. Mr. McNamara proposes a basic security framework: The UN Security Council must provide a guarantee against international aggression and assist in resolving civil conflicts. The major powers must reduce their own stockpiles of conventional and nuclear arms and substantially limit their exports of all types of weapons. There must be tight control of the proliferation of weapons of mass destruction. Mr. McNamara's plan would require unprecedented international cooperation. Its

success will hinge on the development of good working relations and the acceptance of common goals among the major powers, particularly the five permanent members of the Security Council: The United States, the Soviet Union, China, France and Great Britain. Mr. McNamara notes that these nations currently account for eighty percent of the arms exported to developing nations. He also stresses that large amounts of international development lending go indirectly to pay for these arms shipments. Because development assistance is fungible, it often allows governments to use some of their own resources for arms purchases instead of the health clinics, schools, and roads they need. Mr. McNamara believes that assistance in a new world order should be related to a nation's progress in cutting military expenditures. In an address to the World Bank's annual conference on development economics in April 1991 he said that it was "bad economics and bad policy" not to establish such linkage.

Mr. McNamara believes that many nations do have legitimate security concerns, which need to be addressed in order to convince governments that a system of international security permits them to disarm. The East-West tension that fueled regional disputes for decades has now eased, but many international and civil conflicts continue, and others will arise. Only collective action by the major powers can provide the security guarantee needed for arms reduction. As a prerequisite, the major powers would have to agree not to take advantage of regional disputes or to intervene unilaterally in such conflicts to extend their own influence. They would have to support a system that guarantees no nation will be taken over by another, a system that also provides a mechanism for facilitating the resolution of conflicts, civil or international.

The United States and the Soviet Union, Mr. McNamara believes, can help create the environment for such a system of collective security by progressively dismantling their nuclear arsenals. He wants to see the current worldwide stock of more than 50,000 nuclear weapons cut down to less than 200. "The existing strategic forces serve neither the interests of the United States nor the Soviet Union," he writes in a recent issue of the *New York Review of Books*. "The only remaining justification for the enormous size of each state's strategic forces is the other's strategic forces." Mr. McNamara, who served as a U.S. Secretary of Defense in the 1960s, recalls that the United States initially built its nuclear forces to offset the power of Soviet conventional forces in Europe. Later, the United States increased its arsenal to match an anticipated Soviet nuclear buildup, and then each continued to "modernize" in response to the other. But now, with Soviet-American tensions waning, Mr. McNamara sees new dangers. He is concerned that a disintegrating Soviet Union might lose control of its nuclear forces. He also thinks a conflict

involving regional powers with nuclear weapons might draw the superpowers into nuclear confrontation. New policies are needed to avoid these risks, he argues. He calls for the two super powers to go far beyond their current arms reductions agreements and together lead a return to a non-nuclear world.

"It will take time. It will not be done in the next year or two," says McNamara, stressing that now is the time to build momentum for this effort. In a conversation in his Washington office, he confesses that almost all his time is spent working for disarmament and development. His days are filled with writing, consulting, speaking on these issues. "I have found in my travels around the world that there's immense interest in stimulating reductions in military expenditures."

Mr. McNamara has been traveling much of his life. Educated at the University of California, he taught at the Harvard Business School before serving during the Second World War with the U.S. Air Force in Britain, India, China, and the Pacific. On his return to the United States, he joined Ford Motor Company and rose to become first a director, then corporate president. After serving as the U.S. Secretary of Defense, he became president of the World Bank Group in 1968. During his tenure, the Bank shifted emphasis to programs designed to achieve economic growth with social equity. The organization, under his direction, began lending in the sectors of primary education, environmental protection, population planning, basic health services, energy development, and poverty alleviation. The Bank's annual financial commitments increased dramatically under Mr. McNamara's guidance, rising from one billion to more than eleven billion dollars at the time of his retirement in 1981. Since then, he has pursued his personal goals as energetically as he led the Bank.

In addition to his work on creating a new framework for international peace and development, he has also been deeply involved in efforts to help Africa. Africa is at a crossroads, he tells audiences, and to continue in the same direction spells disaster. Such bleak prospects, Mr. McNamara believes, stem from what he sees as Africa's inability to overcome agricultural stagnation, explosive population growth, and degradation of its natural resource base. For each of these, he has prescriptive suggestions. To reach food security, he says food production in Africa will have to increase by at least four percent a year, a point above the continent's population growth rate. To achieve this, African nations will have to create a positive policy environment. This will mean allowing prices to respond to market conditions, reducing government controls, and putting marketing, processing, and exporting back into the hands of individual entrepreneurs. It will mean providing credit at realistic rates from local financial institutions and strengthening land ownership rules so that farmers will invest in

land improvement. With the right incentives, African farmers, like those everywhere else, will produce more. African nations will also have to build locally effective agricultural research and extension programs, improve rural development management, and provide better rural infrastructure. Since women produce eighty percent of the food in Africa, their specific needs should be given priority attention. Finally, the process of modernizing African agriculture must be carried out in an environmentally sound manner.

Improving living standards in Africa, Mr. McNamara contends, also requires effective policies on population growth. The problem, he argues, is not the current size of Africa's population, but that its rate of increase runs ahead of its rate of economic expansion. Therefore, commitment to family planning is essential. A successful effort will require basic education and the generation of public and political consensus.

In many African nations, a new sense of political commitment may be exactly what is needed to get development rolling. "In the past five years or so, there has been one great sea of change for the better," Mr. McNamara writes. "African governments and institutions are coming to the realization that the primary responsibility for Africa's future rests in its own hands. I certainly subscribe to that view." Effective governance is what turns rhetoric into reality. The process of economic policy reform and adjustment must continue, Mr. McNamara urges. To compete on world markets, Africa must boost the level and the efficiency of its investment in economic growth. A long-term strategy involves not just improving the efficiency of markets but investment in public health, nutrition, and education. More attention must be paid to the development of technical skills, and to the regional integration of markets. Not least, there must also be more accountable leadership: a merit system for public servants, less official corruption, more pluralism, and unwavering respect for human rights.

Mr. McNamara stresses that the world at large has an important role: there should be more assistance and broader debt relief. Also important is the need for better communication and cooperation between donors and the nations they assist, as well as better coordination among donors. To help facilitate this, Mr. McNamara has been instrumental in launching the Global Coalition for Africa (GCA) which he describes as a non-traditional "high level political forum for organizing a new partnership between Africa and the donor community." The GCA was set up at the Conference on Africa held in Maastricht, the Netherlands, in July 1990, and was endorsed by the African Heads of State at the Organization of African Unity (OAU) meeting in Addis Ababa the same month. It is designed to provide an umbrella framework for international initiatives on Africa and to monitor progress of long-range plans devised by the World

Bank, the UN Economic Commission for Africa and regional groups. It is guided by an Advisory Committee consisting of economic ministers from Africa and the donor countries, as well as officials of the World Bank, the UN, and other institutions. The GCA has a small staff in Washington overseen by Mr. McNamara and two co-chairmen, President Quett Masire of Botswana, and Mr. Jan Pronk, Minister of Development Cooperation in the Netherlands.

African development, international collective security and arms reduction: these are priorities for Robert S. McNamara. In his mid-seventies, an age when most men spend time reflecting on past accomplishments, he presses on with his vision of the future. If together we are bold, he believes, we can create the world we seek.

This paper was contributed by Richard Deutsch, a Washington-based writer on development.

Intrahousehold Allocation of Health Inputs and Distribution of Health Outcomes among Indonesian Children

Anil B. Deolalikar
1990 Fellow, India

1. Introduction

There is much interest in the issue of gender discrimination in the allocation of health resources within households in developing countries. Studies have focused on two types of discrimination: unequal *allocations* of resources (e.g., food) and unequal nutritional, health, or mortality *outcomes* for males and females. Studies of the former type of discrimination are few since the data requirements for such analysis -- viz., information on the consumption of individuals within households -- are formidable. In contrast, outcomes -- health, nutritional status, and mortality -- are more easily observed at the individual level; they have therefore been analyzed more frequently.

Although it is difficult to generalize from the results of studies for different countries and populations, most studies of intrahousehold resource allocation generally have not found significant gender differences in the consumption of food or nutrients (Subbarao, 1988; Behrman and Deolalikar, 1990; Das

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Anil Deolalikar is currently Associate Professor of Economics at the University of Washington. At the time of printing, Dr. Deolalikar has not yet completed his Fellowship year. This paper is the result of part of his overall research project.

Gupta, 1987; Deaton, 1988).[1] Of course, as I discuss later, intrahousehold gender discrimination can sometimes be quite subtle, and may require more than a simple comparison of mean levels of consumption for males and females in order to be discerned.

Roughly equal allocations of food need not imply that males and females enjoy equal nutritional outcomes, health status, or survival probabilities. Many of the studies analyzing health outcomes, especially in South Asia, have documented compelling evidence of poorer nutritional and health status for females than for males (Miller, 1981; Sen and Sengupta, 1983; Bardhan, 1982, 1984; Sen, 1984; Kakwani, 1986; Das Gupta, 1987; Behrman, 1988a,b).[2] A number of studies have also documented higher post-neonatal mortality rates for female relative to male children (Schultz and Rosenzweig, 1982; Simmons et al., 1982; Das Gupta, 1987). The greater incidence of poor health and mortality among female children thus does not appear to be the result of lower food or calorie intakes, but is likely to reflect general parental neglect in providing medical care for their female children (Das Gupta, 1987; Alderman and Gertler, 1988, 1989). Yet, with the exception of Das Gupta and Alderman and Gertler, scarcely any study has analyzed gender discrimination in the intrahousehold allocation of health expenditures or medical care.[3]

Medical or health care is an important input in the determinant and maintenance of health status. In fact, an inadequate supply of preventive health services, such as immunizations and prenatal care, and an inability to provide prompt curative attention for early symptoms are important factors contributing to poor health status and high mortality

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[1] Although Das Gupta (1987) found evidence of roughly equal calorie intakes for infant boys and girls in her sample of rural households in the Indian state of Punjab, she found gender differences in diet, with girls consuming more cereals and boys consuming more milk and fats.

[2] Outside of Asia, the evidence for significant and large gender differences in nutritional and health outcomes is weak (Strauss, 1990; Svedberg, 1988; and Thomas, 1990 for Africa; Schofield, 1979; Thomas, 1990 for Latin America). See Behrman (forthcoming) for a comprehensive review of the literature.

[3] Das Gupta (1987, p. 86) found that, while calorie intakes were roughly equal for male and female infants zero to one years old, parents spent 134 per cent more on medicines for their male relative to female infants in rural Punjab. Alderman and Gertler (1988, 1989) found that the demand for health care was more responsive to price and income for boys than for girls in Pakistan.

rates in developing countries.[4] As a result, many developing countries have committed sizable resources to establish large public health-care systems, many of which typically provide services at little or no cost to patients in order to promote access to health for all socioeconomic groups (de Ferranti, 1985). Gender inequality in access to and utilization of primary health services should, therefore, be a matter of concern to public policy.

2. What Constitutes Gender Discrimination within Households?

What constitutes gender bias is a matter of contention. At the simplest level, significant gender differences in the mean levels of nutritional or health status can be construed as gender discrimination. However, to the extent that other factors that also determine health and nutritional outcomes, such as age and schooling, may differ across males and females, observed gender differences in health/nutritional outcomes may be spurious and the result of gender differences in the excluded factors. Inclusion of a gender dummy in a multivariate regression of health/nutritional outcomes on individual and household characteristics can resolve this problem. The sign, magnitude, and significance of the gender coefficient can indicate the presence of systematic gender discrimination after controlling for the effects of other factors.

However, discrimination may exist in more subtle forms. For instance, Behrman and Deolalikar found, for a sample of households in rural India, that, although the *average* nutrient intakes of female children were not significantly lower than those of male children, they were more adversely affected by

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[4] Some observers have argued that Sri Lanka, China, and the Indian state of Kerala have primarily achieved low morbidity and mortality rates (relative to their per capita incomes) by their success in sensitizing individuals to even minor illnesses and in getting them to seek early treatment (Caldwell et al., 1983; Panikar and Soman, 1984). Indeed, the experience of Kerala state in India suggests that high income and *even high nutrient intakes* may not be strictly necessary for low levels of mortality. Kerala has one of the lowest per capita incomes and average calorie and protein intakes of any Indian state (Panikar and Soman, 1984). Surprisingly, it also has the lowest mortality rates of any Indian state. This paradox is in part the result of Kerala's success in controlling infections, achieved largely via successful immunization programs and prompt curative intervention, made possible by easy accessibility of the rural population to primary health services (Panikar and Soman, 1984).

changing food prices. In other words, the food price elasticities of nutrient intakes were significantly more negative for girls than for boys, which meant that girls were at greater nutritional risk during times of food scarcity (when food prices are likely to rise). Alderman and Gertler (1989) also observed larger price and income elasticities of the demand for health care for girls than for boys in Pakistan. Using Brazilian survey data, Thomas (forthcoming) also observed gender differences in the effect of parents' education on their children's heights. Thus, discrimination can occur not only in the form of gender differences in nutrition and health outcomes but also in the form of gender differences in the *effects of the economic environment* on nutrition and health outcomes. It is therefore important to allow for gender-specific price, income, and other effects in analyzing the determinants of health or nutritional outcomes.

Interactions between gender and other determinants of health and nutritional outcomes may be important for another reason. The literature on intrahousehold allocation suggests that parental behavior does not always result in a *general* discrimination against female children. For example, Das Gupta (1987) found that parental neglect fell selectively on the subset of female children born into households that already had a surviving daughter. Selective discrimination of this type cannot be detected without interacting gender with other individual characteristics, such as birth order or age, in equations explaining health inputs or outcomes.

3. Theoretical Considerations

The focus of this paper is on the reduced-form demand relations for child health inputs and outcomes as dependent on prices, income, and other child, household, and community characteristics. Such relations are consistent with constrained maximization of a unified preference function or with the bargaining framework emphasized by Manser and Brown (1980), McElroy and Horney (1981), and Folbre (1984a,b, 1986).[5] In

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[5] Available data generally do not permit testing a bargaining model with a fixed structure against the maximization of common preferences (Rosenzweig and Schultz, 1984). McElroy and Horney (1981), Schultz (1990), and Thomas (1990b), among others, have argued that differential effects on human capital outcomes of unearned income accruing to husbands and to wives provide support for the bargaining model. However, the conditions under which this is likely to be true are quite restricted (Chiappori, 1988a,b). At any rate, since unearned income data are not available separately for males and females

either case, preferences are defined over the health status of individuals, and the constraints typically include a budget or income constraint and biological health production functions for each individual that characterize the "production" of health from food, nutrition, and health care inputs, conditional on the health endowments of that individual, on the state of health technology (embodied in, say, the education of the health-care provider at home -- typically, the mother), and on various environmental influences (such as availability of clean drinking water).[6]

The intrahousehold allocation process results in a system of reduced-form individual demand equations for health status, as well as derived demand equations for food and nutrient consumption, health care, and other health-related inputs. These reduced-form equations have as arguments all prices (e.g., of food, other consumption goods, and health care), household income, personal characteristics of household members, and relevant family- and location-specific environmental variables.

Typically, most empirical studies estimate one set of reduced-form demand relations for the entire sample; thus, all individuals within a household are assumed to respond identically to changes in prices, income, or other variables. This is an overly restrictive assumption because age and gender differences in preferences, biological health production functions, and health and other endowments may lead males and females or children and adults within households to respond differently to identical exogenous changes in the environment.

This paper focuses on the demand for health status and the derived demand for health-related inputs for children under five years of age. It assumes implicitly that the health demand relations differ by age groups.[7] The estimated demand relations are explicitly allowed to differ by gender. the equations to be estimated are:

$$(1) \qquad N_i = a^j + b^j X_i + c^j H_i + d^j C_i + \mu_i, j = b, g,$$

where

i	indexes the individual child,
j	indexes gender (b=boys and g=girls)

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in the Indonesian SUSENAS survey, the distinction between a bargaining and common-preference approach is not relevant here.

[6] See Behrman and Deolalikar (1988) for a generic household model of health determination in a developing country context.

[7] Although the demand relations for older children and adults are not estimated in this paper.

N = vector of health care inputs and health outcomes,
X = vector of individual characteristics (e.g., age, birth order),
H = vector of household characteristics, including income and family size
C = vector of community-level characteristics, including health-care prices and health infrastructure, and
μ = stochastic disturbance term.

It is important to note that, since the relations in (1) are of the reduced form, all dependent variables -- whether health inputs or health outcomes -- have the same set of explanatory variables. Since health status is a normal good, the effect of household income on health outcomes and on most health inputs (with the exception of inferior health-care options like traditional healers) will be positive. The impact of health-care prices on health inputs and outcomes will generally be negative. To the extent that health infrastructure and proximity to health facilities serve to reduce the total cost (cash price plus the opportunity cost of time) of using health services, these variables will most likely be associated with higher levels of health inputs and therefore improved health outcomes. Of course, these are broad generalizations. To the extent that different types of health providers are substitutes for each other, an increase in the availability of or reduction in the price charged by "modern" health facilities will increase the demand for modern health providers but reduce that for traditional healers.

4. Background, Data, and Empirical Model

With a total population estimated at 175 million in mid-1988, Indonesia is the fifth most populous country in the world (World Bank, 1990). Although the World Bank ranks Indonesia as a low-income economy with a per capita income of $440 in 1988, the Indonesian economy has enjoyed rapid economic growth during the last two decades. For example, between 1965 and 1988, Indonesia achieved an annual growth rate of per capita GNP of 4.3% -- a rate that few developing countries could match. Available estimates also suggest an impressive reduction in infant mortality in Indonesia during the same period -- from 128 infant deaths per 1,000 live births in 1965 to 68 in 1988 (World Bank 1990). Despite this performance, Indonesia has one of the highest infant and maternal mortality rates among Southeast Asian countries. In 1988, for example, Indonesia had much higher infant and maternal mortality levels than the Philippines, Thailand, or even Vietnam. Anemia is the major cause of maternal mortality (Gopalan; 1988), while immunizable

diseases (particularly tetanus), diarrhea, and acute respiratory infections are thought to be the leading causes of infant and child mortality (Government of Indonesia - UNICEF, 1989).

The data for this study come from the 1987 round of the National Socioeconomic Survey (SUSENAS), which is a nationally representative survey of Indonesia that is undertaken periodically. The 1987 round, conducted in January, covered roughly 250,000 individuals residing in 50,000 households. While focusing on the health status of individuals and the choice of health providers for curative care, the 1987 SUSENAS survey obtained detailed information on household consumption expenditures and income as well. Using both one-week and three-month recall techniques, the health module collected data on perceived illnesses (occurrence, type, and length) and the choice of provider for any treatment obtained. In addition, for all children under five years of age, data were collected on age, possession of a birth certificate, birth order, weight, feeding habits (including the duration of breast feeding), and immunization history.

The other data source used is the Village Potential (*Potensi Desa*) module of the Economic Census 1986 -- a census of all the villages in Indonesia. The Economic Census reports extensive information on the social and economic infrastructure of villages. Although, in principle, it is possible to merge the SUSENAS household data with the village-level information from the Economic Census, the SUSENAS data tapes identify only the district (*kabupaten*) -- not the village -- of residence of households in order to protect their confidentiality. Hence, I have aggregated the health facilities data from the Economic Census at the level of districts before merging it with the household-level SUSENAS data.

The major problem with the health module of the 1987 SUSENAS survey is that no clinical diagnosis was performed in assessing morbidity. All measures of morbidity are respondent-reported, and as such are subject to measurement error and respondent biases in illness perception. There is not much that can be done about this problem, except to recognize the potential biases it may cause in the empirical estimates. It is usually possible to speculate on the direction of such biases, since we know that certain variables, like mother's education and household income, are associated with increased perception and early recognition of illness.

But, while the *perception* of an illness is subject to reporting errors and therefore likely to depend on such factors as maternal education or income, the *duration* of an illness, *conditional on an illness already being reported*, is less likely to be subject to systematic biases. Hence, one can use the alternative measure of length of illness to examine the robustness of empirical relations involving health outcomes. Another advantage of the 1987 round is that information on child weights was collected. Since weight-

for-age is an important indicator of nutritional and health status -- one that is not reported by respondents -- it can be used as another proxy for health outcome for children under five.

The SUSENAS data on morbidity were collected on the basis of both *one-week* and *three-month recall*. Since three months is generally too long a period to recall an illness with any accuracy, the one-week recall data are likely to be more reliable. In the analysis undertaken here, both measures of morbidity are used to examine the robustness of the empirical results.

The vector of *health-care inputs* includes both curative care (viz., whether treatment was provided for an illness during the week and during the three months preceding the interview, and the choice of providers for those respective treatments) and preventive care (viz., whether child received DPT, BCG, measles, or polio vaccines). *Health outcomes* are proxied by the occurrence of an illness during the preceding week/three months and the length of any such illness. In addition, the age- and sex-standardized weight of a child and the degree of malnutrition (viz., mild, moderate, and severe, according to the Gomez classification system) are included as indicators of health (or, more appropriately, nutritional) outcomes. Child weight is standardized by the median weight of a well-nourished child of the same age and sex in a reference population, viz., the United States (National Center for Health Statistics, 1976).[8]

The *individual child characteristics* that are included in the health demand relations are sex, age (in months), birth order, and the presence of a birth certificate for the child. The latter is a proxy for the health awareness of a child's parents, particularly its mother. Only 42% of children zero to four years of age had a birth certificate. The vector of *household characteristics* includes family size, urban/rural status of residence, years of schooling by the child's mother and by the household head, and the natural log of per capita monthly income. The vector of *community characteristics*, data on which are obtained from the 1986 Economic Census, includes the proportion of villages in the household's district of residence having (a) a modern health facility (viz., a hospital, mother-and-child clinic, public health center, family planning post, or general practitioner), (b) a resident physician or health worker (health supervisor, nurse, or trained midwife), (c) access to piped drinking water, (d) an all-weather road, and (e) access by water only. The last variable is relevant because a number of villages in Indonesia, especially in the Outer Islands, can only be reached by water; the isolation of

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[8] Sample-based standardizations are not appropriate for studying gender discrimination, since the standards themselves may reflect the long-term consequences of gender discrimination in a society.

such villages significantly reduces access to health centers and facilities. In addition, the mean (over all the villages in a household's district of residence) distance to the nearest subdistrict (*kecamatan*) town is included as an additional proxy for access to general health facilities. Finally, regional dummies are included for Java-Bali and Sumatra, with the Outer Islands serving as the base category. Population densities are much higher in Java and Bali than in Sumatra, and are much greater in Sumatra than in the Outer Islands. This may have implications for environmental and hygiene conditions as well as for the availability and quality of health facilities in the three regions.

5. Gender Differences in Health Inputs and Health Outcomes

Table 1 reports the mean levels of health care and other inputs and nutritional and health outcomes for the entire sample as well as for boys and girls separately. The 1987 SUSENAS data yielded data on 28,192 children under the age of five years. A total of 3, 046 episodes of illness were reported with the one-week recall method, giving a period prevalence rate of 11%. This is a fairly high prevalence rate, since it implies, upon extrapolation to an annual rate, that each child experienced an average of 5.6 episodes of illness per year.[9] Relatively few (5.5.%) of the reported illnesses were not treated at all; about 25% were treated at home by the family, and 4.2% were treated by traditional healers. The remaining two-thirds were treated in the modern sector, with public health centers (*puskesmas*) being the most common health providers (34.7%). The average duration of an illness experienced during the preceding week was 4.2 days.

As would be expected, the three-month recall technique results in a very significant under-reporting of illness. Only 21% of the children were reported ill during the three months preceding the interview, which translates into an annual prevalence rate (of .8 illness episodes per year) that is only 15% of the prevalence rate obtained from the one-week recall method. However, the pattern of utilization of different health providers for treatment is remarkably similar to that obtained with the one-week recall method. The average length of an illness during the preceding three months was reported to be 6.8 days.

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[9] In a survey in West Java in 1985, Berman et al., (1987, p.290) obtained a two-week prevalence rate of 9.47%, which translates into an annual rate of 2.46 episodes per person per year. However, rates were not computed separately for children and adults in that study.

Table 1
Means and Standard Deviations
Children Under 5 Years,
Indonesia, 1987

Variable	GIRLS			BOYS			ALL CHILDREN		
	No. of obs.	Mean	Std. Dev.	No. of obs.	Mean	Std. Dev.	No. of obs.	Mean	Std. Dev.
Age (month)	13,666	28.646	16.128	14,526	28.455	16.175	28,192	28.547	16.152
Birth Order	13,663	3.050	2.051	14,525	3.064	2.142	28,188	3.052	2.099
Whether immunized?	13,666	0.555	0.497	14,526	0.550	0.498	28,192	0.552	0.497
Whether breastfed?	13,666	0.982	0.133	14,526	0.982	0.132	28,192	0.982	0.132
% of time (months) since birth breastfed	13,666	66.320	30.581	14,526	66.744	30.738	28,192	66.538	30.662
Weight as % of U.S. NCHS standard*	13,666	83.190	12.299	14,526	80.369	12.418	28,192	81.736	12.441
Whether normal nutrition?*	13,666	0.466	0.499	14,526	0.519	0.500	28,201	0.493	0.500
Whether mildly malnourished? *	13,666	0.408	0.491	14,526	0.380	0.485	28,201	0.393	0.488
Whether moderately malnourished?*	13,666	0.110	0.314	14,526	0.089	0.285	28,201	0.100	0.299
Whether severely malnourished?*	13,666	0.015	0.122	14,526	0.012	0.110	28,201	0.014	0.116
Reference Period: Last week									
Whether ill?	13,666	0.107	0.309	14,526	0.109	0.312	28, 192	0.108	0.310
If ill, duration of illness (days)*	1,460	4.240	1.998	1,586	4.070	1.994	3,046	4.151	1.997
Treatment Choice:									
None	1,460	0.049	0.217	1,586	0.060	0.237	3,046	0.055	0.228
Self or family*	1,460	0.236	0.425	1,586	0.262	0.440	3,046	0.249	0.433
Traditional healer	1,460	0.045	0.206	1,586	0.040	0.195	3,046	0.042	0.201
Paramedic	1,460	0.119	0.324	1,586	0.110	0.313	3,046	0.115	0.319
Polyclinic	1,460	0.049	0.217	1,586	0.047	0.211	3,046	0.048	0.214
Public health center	1,460	0.358	0.479	1,586	0.337	0.473	3,046	0.347	0.476
Hospital	1,460	0.062	0.241	1,586	0.062	0.242	3,046	0.062	0.241
Physician	1,460	0.083	0.276	1,586	0.082	0.274	3,046	0.082	0.275
Reference Period: Last 3 Months									
Whether ill?	13,666	0.208	0.406	14,526	0.210	0.407	28,192	0.209	0.407
If ill, duration of illness (days)*	2,846	6.728	7.864	3,052	6.858	8.686	5,898	6.795	8.299
Treatment choice:									
None*	2,848	0.029	0.169	3,054	0.039	0.194	5,902	0.035	0.183
Self or family	2,848	0.220	0.414	3,054	0.228	0.419	5,902	0.224	0.417
Traditional healer	2,848	0.047	0.212	3,054	0.048	0.214	5,902	0.048	0.213
Paramedic	2,848	0.128	0.334	3,054	0.125	0.331	5,902	0.127	0.333
Polyclinic	2,848	0.045	0.206	3,054	0.046	0.208	5,902	0.045	0.207
Public health center*	2,848	0.379	0.485	3,054	0.358	0.480	5,902	0.368	0.482
Hospital	2,848	0.065	0.246	3,054	0.063	0.243	5,902	0.064	0.244
Physician	2,848	0.087	0.283	3,054	0.093	0.290	5,902	0.090	0.287
Household characteristics:									
Mother's schooling years							28,192	4.821	3.452
Household head's schooling years							28,192	5.575	3.781
Monthly per capita income							28,192	25501.894	33162.459
Household size							28,192	5.837	2.174
Whether hh. residing in urban area							28,192	0.292	0.455
Whether hh. residing in Java or Bali							28,192	0.310	0.462
Whether hh. residing in Sumatra							28,192	0.278	0.448
Proportion of villages in kabupaten with:									
accessibility only by water							28,192	0.071	0.154
any modern health facilities							28,192	0.809	0.191
any resident health worker or physician							28,192	0.517	0.246
all-weather road							28,192	0.777	0.223
availability of piped drinking water							28,192	0.091	0.171
Avg. distance from subdistrict town**							28,192	3.744	3.523

Notes: * Indicates that the mean value for girls is significantly different from that for boys at the 5% level.
** Average for all villages in the kabupaten or district.

The incidence and duration of illness, as well as the pattern of treatment, are very similar for male and female children. In fact, only four variables have mean values that differ significantly (at the 5% level) between male and female children. These are (a) the duration of an illness during the preceding week, (b) the proportion of illness episodes during the preceding week that were treated at home by the child's family, (c) the proportion of illness episodes during the preceding three months that were not treated at all, and (d) the proportion of illness episodes during the preceding three months that were treated at public health centers. The gender differences in the mean values of these variables are, however, numerically small (with the single exception of illness episodes during the preceding three months that were not treated). Further, if anything, the gender differences in health care utilization appear to favor girls. Thus, while no treatment was sought for only 2.9% of the girls having an illness during the preceding three months, the corresponding number for boys was 3.9%. Similarly, 26.2% of boys -- but only 23.6% of girls -- who were ill during the preceding week were treated at home by the family.

The situation with respect to utilization of preventive care and non health-care inputs appears to be no different. The%age of boys and girls that are immunized is virtually identical (about 55%), as is the percentage breastfed (98%). The average duration of breastfeeding is also not significantly different across boys and girls. Thus, there appear to be no systematic gender differences in the prevalence of illnesses, the utilization of curative and preventive health care, and in the duration of breastfeeding among children under five.

However, nutritional outcomes do differ significantly between boys and girls. While boys on average weigh 80.4% of the U.S. standards, girls weigh 83.2% -- a significant difference. Surprisingly, despite the weight advantage of girls at the mean, significantly larger proportions of girls than boys experience mild, moderate, and severe malnutrition, and a smaller proportion are normal, according to the widely used Gomez classification. For example, 46.6% of girls are not malnourished, as opposed to 51.9% of boys. On the other hand, 11% of girls but 8.9% of boys are moderately malnourished. All of these differences are significant.[10]

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[10] Of course, it is possible that the boy-girl differences in standardized weights may not mean much, since there are likely to be important differences in the growth curves in the United States and in Indonesia. Indeed, as the regression analysis results show later, there remains a systematic relationship between the age of a child and its weight, even after the latter has been standardized, which suggests that the U.S. standardization

As discussed earlier, simple comparisons of mean values of variables across male and female children do not provide a sufficient basis for assessing gender bias in the intrahousehold allocation or distribution of resources. It is important not only to control for the effects of variables other than gender, but to allow for differing health responses by boys and girls to exogenous changes in the environment. The analysis of the determinants of health care use and health outcomes is undertaken next.

6. Estimated Demand Relations for Curative Health Care

The health module of the SUSENAS survey collected information on eight types/sources of treatment for illnesses reported during the previous week and the previous three months: no treatment, self-treatment, traditional healer, private physician, hospital, public health center, polyclinic, and paramedic. To handle the discrete nature of treatment choice, I use a multinomial logit model, estimated by the maximum likelihood method. Since each treatment alternative adds a total of thirty-six parameters to be estimated (eighteen independent variables, each interacted with a gender dummy variable), I have collapsed the eight treatment choices into three broad alternatives: no treatment (with the dependent variable assuming a value of zero), self-treatment or treatment from a traditional healer (value of one), and treatment from a modern health provider (which includes all the remaining choices) (value of two). With the one-week recall data, the proportion of children receiving these three treatment methods were 5.5, 29.3, and 33.8%, respectively, with no significant gender differences.

The estimates of the treatment choice model are shown in Table 2. Since the value of the dependent variable is zero for no treatment, the latter serves as the base category for comparison. Because Wald tests failed to reject the hypothesis of equal coefficients for boys and girls with both the one-week and three

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is probably not ideal. Thomas (1990) found that girls were significantly taller than boys in Ghana and Brazil, relative to U.S. National Center for Health Statistics (NCHS) standards. He, too, speculated that the reason for such differences is unlikely to be gender bias, but rather growth paths that are systematically different form those in the United States. He concludes that comparisons of levels of standardized anthropometric measures seem to be a weak basis for statements about the presence or absence of gender bias in a society.

Table 2
Maximum Likelihood Multinomial Logit Estimates for Treatment of Illness
Children Under 5 Years,
Indonesia, 1987*

	FOR ILLNESS DURING PREVIOUS WEEK				FOR ILLNESS DURING PREVIOUS 3 MONTHS			
	Self-treatment or Traditional Healer		Modern Treatment		Self-treatment or Traditional Healer		Modern Treatment	
Independent variable	Estimate	T-ratio	Estimate	T-ratio	Estimate	T-ratio	Estimate	T-ratio
Intercept	1.553	0.9	-0.837	-0.5	1.730	1.1	-0.762	0.5
Possession of birth certificate	0.001	0.0	0.336	1.8	0.016	0.1	0.334	2.0
Age (months)	0.014	2.4	0.011	2.0	0.012	2.3	0.007	1.5
Whether child male	-0.120	-0.7	-0.271	-1.6	-0.246	-1.6	-0.343	-2.3
Birth order of child	-0.043	-0.9	-0.124	-2.6	-0.058	-1.3	-0.090	-2.1
Mother's schooling years	0.098	2.6	0.128	3.6	0.074	2.2	0.116	3.6
Hh. head's schooling years	-0.041	-1.2	-0.021	-0.6	-0.017	-0.5	0.005	0.2
Ln per capita monthly income of hh.	-0.100	-0.6	0.240	1.5	-0.070	-0.5	0.300	2.0
Household size	0.058	1.1	0.074	1.4	0.087	1.8	0.081	1.7
Whether hh. residing in urban area	0.027	0.1	0.066	0.3	-0.097	-0.4	-0.012	-0.1
Proportion of villages in kabupaten with:								
accessibility only by water	4.702	4.1	3.531	3.1	1.882	3.3	0.776	1.4
any modern health facilities	-0.336	-0.5	-0.507	-0.7	-0.182	-0.3	-0.816	-1.4
any resident health worker or physician	-1.115	-2.0	-0.232	-0.4	-0.943	-1.9	0.300	0.6
all-weather road	1.303	2.4	0.428	0.8	0.843	1.9	0.302	0.7
availability of piped drinking water	1.253	1.3	1.695	1.9	0.844	1.1	0.743	1.0
Avg distance from subdistrict town**	-0.039	-1.3	-0.041	-1.5	-0.030	-1.2	-0.046	-1.9
Dummy for Java or Bali	0.163	0.6	0.611	2.4	0.342	1.5	0.681	3.0
Dummy for Sumatra	0.596	2.2	0.725	2.7	0.911	3.8	0.870	3.7
Log-likelihood ratio	-2.273				-4,019			
Number of observations	3,031				5,682			
Wald test for equality of all slope coefficients across boys and girls ***	19.662				11.843			

Notes: * Base category is no treatment.
** Average for all villages in the kabupaten or district.
*** This is a chi-squared test with 16 degrees of freedom.

month recall data (see test statistics in Table 2), the data for boys and girls were pooled and single models were estimated.

The estimated coefficients on the gender variable are consistently negative, although not always significantly different from zero, which suggests that, holding other factors constant, boys have a lower probability than girls of receiving any type of treatment (whether self/traditional or modern) for their illnesses. This result persists whether one considers the one-week or the three-month recall data. Indeed, with the three-month recall method, boys appear to have a *significantly* lower probability than girls of receiving treatment from a modern provider. Thus, if there is any evidence of gender discrimination by households in the provision of curative care -- and it is quite scant here -- it is in favor of girls.

Interestingly, while the gender coefficient has a consistently negative sign, a child's age has a consistently positive and significant sign. Older children appear to have a higher probability of receiving some treatment. Holding age and other variables constant, higher birth-order children have a significantly *lower* probability of receiving treatment from a modern provider than lower birth-order children. Thus, there is some evidence of household discrimination in favor of first-borns and older children in the provision of medical care.

The other parameter estimates of the treatment choice model indicate that a higher level of mother's schooling, although not the schooling of the household head, is associated with an increased probability of traditional (relative to no treatment) and of modern (relative to traditional) treatment. Per capita household income raises the probability of modern treatment, although not significantly in the case of one-week recall data. Children with birth certificates have a higher probability of receiving modern treatment relative to children with no birth certificates.

The access and health infrastructure variables present mixed evidence. There are some surprising results, such as the finding that lack of land access (or water access only) to a village raises the probability of both self/traditional and modern treatment (although, not surprisingly, it increases the former much more than the latter). The findings that the availability of modern health facilities has no significant effect on the choice of treatment and that a resident health worker or physician is not associated with increased use of modern health facilities are also surprising. Also, the lack of significance of a household's urban status on the choice of treatment is counterintuitive. But there are some anticipated results, such as the one indicating the negative (although not significant) effect of distance to the nearest subdistrict town on the probability of any treatment. In addition, although a resident health worker or physician is not associated with an increased probability of modern treatment,

Table 3
Determinants of Immunization and Duration of Breastfeeding
Children under 5 Years,
Indonesia, 1987

Independent Variable	Logit Estimates of Probability of Immunization		Tobit Estimates of Duration of Breastfeeding*	
	Estimate	T-Ratio	Estimate	T-Ratio
Intercept	-4.226	-15.2	183.047	49.7
Possession of birth certificate	0.735	25.4	-0.790	-2.0
Age (months)	0.015	18.6	-2.075	-162.3
Whether child male	-0.040	-1.5	0.341	1.0
Birth order of child	-0.041	-5.3	1.195	11.6
Mother's schooling years	0.068	12.4	0.080	1.1
Hh. head's schooling years	0.050	10.1	-0.361	-5.5
Ln per capita monthly income of hh.	0.206	7.6	-4.111	-11.5
Household size	0.010	1 3	-1.074	-10.7
Whether hh. residing in urban area	0.270	7.2	-5.854	-11.8
Proportion of villages in kabupaten with:				
accessibility only by water	-0.596	-6.0	1.524	1.1
any modern health facilities	0.363	3.7	7.065	5.2
any resident health worker or physician	0.803	9.2	-2.146	-1.9
all-weather road	0.559	6.2	-5.539	-4.5
availability of piped drinking water	-0.742	-6.5	-7.402	-5.3
Avg. distance from subdistrict town**	-0.010	-2.3	-0.205	-3.4
Dummy for Java or Bali	0.491	12.2	5.345	9.9
Dummy for Sumatra	-0.183	-5.3	-2.997	-6.4
SIGMA			27.010	179.3
Log likelihood Ratio	-16,606		-90,143	
No. of obs.	27,989		27,989	
Wald test for equality of all slope coefficients across boys and girls***	12.401		20.422	

Notes: * Duration of breastfeeding is expressed as the percentage of time since birth that the child has been breastfed. The model estimated is a tobit with upper truncation at 100 %
** Average for all villages in the kabupaten or district.
*** This is a chi-squared test with 16 degrees of freedom.

he/she is associated with a reduced probability of self/traditional treatment.

Finally, the coefficients on the regional dummy variables indicate that residence in Java or Bali is associated with increased probability of modern treatment (relative to residence in the Outer Islands), while residence in Sumatra is associated with greater probability of both self/traditional and modern treatment (also relative to residence in the Outer Islands). A comparison of the coefficients on Java-Bali and Sumatra for the modern treatment alternative suggests that Sumatrans have a somewhat higher probability of using modern health providers relative to Javanese and Balinese.

7. Estimated Demand Relations for Preventive Health Care and Breastfeeding

The estimated demand relations for the probability of immunization and the duration of breastfeeding are shown in Table 3. Only 55% of the sample children under five were immunized, with no significant gender difference in this ratio. I estimate the probability of a child being immunized with the maximum likelihood binomial logit method. Although in principle, the same method can be used to estimate the probability of breastfeeding, there is little sample variation in the probability of breastfeeding (which is .98 at the sample mean). The duration of time since birth (in months) that a child was breastfed does, however, vary substantially in the sample. Since this variable is strongly linearly dependent on age -- an explanatory variable in the demand equation -- I have transformed the duration of breastfeeding so as to express it as the%age of time (months) since a child's birth that (s)he was breastfed. Since this variable has an upper truncation at 100% (with 35.9 percentage of observations concentrated at this point),[11] I estimate the duration of breastfeeding by the maximum likelihood tobit method.

Estimates of both equations are shown in Table 3. As in the case of health care inputs, Wald tests could not reject the null hypotheses of equal coefficients for boys and girls. Hence, data for both sexes were pooled, and single equations estimated for the probability of immunization and the duration of breastfeeding. The coefficient on the gender dummy is negative in the probability of immunization equation, suggesting that boys have a lower probability than girls of being immunized. However, the estimate merely approaches, but does not reach, significance at

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[11] In contrast, as noted earlier, only 1.7% of the observations are concentrated at zero.

conventional levels. The gender dummy is not significant in the duration of breastfeeding equation. Thus, there is no conclusive evidence of gender bias in the intrahousehold allocation of preventive care inputs or breastfeeding.

Almost all of the other estimates of the immunization equation are consistent with *a priori* expectations. Mother's schooling, schooling of the household head, household per capita income, and the household's urban status all have very significant, positive impacts on the probability of immunization. The availability of modern health facilities, resident health workers, and good all-weather roads significantly increase the probability of a child being immunized, while water access and distance from the subdistrict town reduce this probability. Somewhat surprisingly, the availability of piped drinking water is associated with a lower probability of immunization. The latter finding *might* reflect that households view clean drinking water and preventive care (viz., immunization) as substitutes, so that increased availability of the former reduces their demand for the latter.

It is difficult to interpret the coefficient on age in the immunization equation because children can only be immunized against specific conditions after a certain age. The results indicate a strong, positive age dependence of the probability of immunization. However, even after holding age constant, birth order has a significant negative effect on the probability of immunization, which is consistent with the earlier evidence that higher birth-order children are less likely to be treated by modern health providers for their illnesses.

Likewise, because of a strong linear dependence of length of breastfeeding on the age of a child, the coefficient on age in the breastfeeding duration equation is difficult to interpret. The results show a very strong negative association between a child's age and how long it was or has been breastfed.

Often, among poor households in developing countries, breastfeeding is prolonged so as to delay the purchase of breast-milk substitutes from the family's limited food budget. In this sense, long duration of breastfeeding may be an inferior input into childs' health.[12] The empirical finding that, even after controlling for age, children belonging to households with better-educated heads, higher per capita incomes, and urban residence are breastfed for shorter periods than children from households with poorly educated heads, lower per capita incomes, and rural

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[12] Indeed, a regression of standardized child weight on age, sex, birth order, immunization history, mother's schooling, and duration of breastfeeding, which could be interpreted as a health production function, produced a significant negative coefficient on the breastfeeding duration variable.

status suggests that the length of breastfeeding is indeed perceived as an inferior health input by households. Similarly, children possessing birth certificates (and whose mothers presumably have greater health awareness) are breastfed for shorter periods than children without birth certificates. However, somewhat surprisingly, mother's schooling itself has no significant effect on the length of breastfeeding.

Household size has a negative association with length of breastfeeding, perhaps reflecting the fact that, in larger households with more children, there is increased competition for breastfeeding and, as such, shortened duration of breastfeeding for each child.

Availability of locally resident health workers, good road, piped drinking water, and proximity to a subdistrict town are all associated with a shorter duration of breastfeeding. Surprisingly, however, availability of modern health facilities is associated with a longer length of breastfeeding.

Finally, if the length of breastfeeding is indeed an inferior input in health production, the empirical results are indicative of birth-order bias in the allocation of breast-milk substitutes among children. Even after controlling for age, higher birth-order children are breastfed (and thereby, presumably, denied breast-milk substitutes) for significantly longer duration than lower birth-order children.

8. Estimated Relations for Health and Nutritional Outcomes

The data on health care and breastfeeding do not show any evidence of systematic gender bias in household decisions, although there is some evidence of bias against higher birth-order children. Since the production and maintenance of good health involves many more inputs than curative and preventive health care and breastfeeding, some of which may be unobserved, a test for gender or other forms of intrahousehold discrimination is not complete without an analysis of the intrahousehold distribution of nutritional or health *outcomes* among children.

There are two variables in the SUSENAS survey that can be used as proxies for health status: episode and length of an illness. As discussed earlier, the illness measures are self-reported, using one-week and three-month recall. Since three months is too long a period to recall illness episodes accurately, the one-week recall data are probably more reliable. I use both sets of recall data in the analysis of health outcomes, although obviously the one-week results should be given greater emphasis. Self-reported measures of morbidity are subject to respondent bias, but it is often possible to speculate on the direction of the bias and its

Table 4
Determinants of Illness Incidence and Length of Illness, if Ill
Children under 5 Years,
Indonesia, 1987

	REFERENCE PERIOD: PAST WEEK						REFERENCE PERIOD: PAST 3 MONTHS			
	Logit Estimates		OLS Estimates Length of Illness, if Ill				Logit Estimates		OLS Estimates Length of Illness, if Ill	
	Whether Ill		Girls		Boys		Whether Ill			
Independent variable	Estimate	T-Ratio	Estimate	T-Ratio	Estimate*	T-Ratio**	Estimate	T-Ratio	Estimate	T-Ratio
Intercept	-2.128	-5.4	4.752	4.6	3.944	-0.6	-0.890	-2.9	5.074	2.3
Possession of birth certificate	0.007	0.2	0.145	1.2	-0.083	-1.4	-0.025	-0.7	-0.504	-2.1
Age (Months)	-0.006	-5.2	-0.013	-3.7	-0.006	1.4	-0.002	-2.2	-0.004	-0.6
Whether child male	0.022	0.6					0.012	0.4	0.148	0.7
Birth order of child	-0.012	-1.0	-0.053	-1.6	0.051	2.3	-0.008	-0.9	0.136	2.0
Mother's schooling years	-0.006	-0.08	-0.023	-1.1	0.023	1.6	0.007	1.2	-0.034	-0.8
Hh. head's schooling years	-0.010	-1.4	-0.001	0.0	-0.056	-2.0	-0.010	-1.7	-0.097	-2.3
Ln per capita monthly income of hh.	0.094	2.5	-0.049	-0.5	0.022	0.5	0.062	2.1	0.104	0.5
Household size	-0.044	-3.9	0.037	1.2	-0.006	-1.0	-0.063	-7.2	-0.012	-0.2
Whether hh. residing in urban area	-0.061	-1.1	-0.044	-0.3	-0.152	-0.5	-0.138	-3.3	-0.526	-1.7
Proportion of villages in kabupaten with:										
accessibility only by water	-0.672	-4.4	0.136	0.3	-0.966	-2.0	-0.140	-1.3	-2.950	-4.0
any modern health facilities	0.022	0.1	0.040	0.1	1.013	1.7	-0.208	-1.9	3.357	4.2
any resident health worker or physician	0.190	1.5	-0.121	-0.4	0.309	0.9	0.290	3.0	-0.522	-0.7
all-weather road	-0.326	-2.5	0.450	1.3	-0.741	-2.3	-0.329	-3.3	0.437	0.6
availability of piped drinking water	-0.060	-0.4	-0.269	-0.7	-0.323	-0.1	-0.311	-2.6	-1.627	-1.9
Avg. distance from subdistrict town***	0.007	1.0	0.026	1.5	-0.021	-1.9	-0.018	-3.5	-0.051	-1.4
Dummy for Java or Bali	-0.289	-5.0	-0.103	-0.6	-0.111	0.0	-0.258	-5.8	-1.388	-4.2
Dummy for Sumatra	-0.456	-8.6	-0.178	-1.2	0.042	1.1	-0.342	-8.5	-1.478	-5.0
Log likelihood Ratio	-9,495						-14,232			
R-squared			0.024						0.020	
F-ratio			2.250						7.104	
Number of obs.	27,985		3,031				27,985		5,878	
Wald test for equality of all slope coefficients across boys and girls****	16.049						11.641			
F-test for equality of all slope coefficients across boys and girls			1.801						0.704	

Note:
* These are the actual estimates for boys, and not the coefficients on the slope dummies.
** The t-statistics in this column are for the slope dummy coefficients. The null hypothesis is that the coefficients for boys do not differ from those for girls.
*** Average for all villages in the kabupaten or district
**** This is a chi-squared test with 16 degrees of freedom.

relation to variables, such as education and income. Also, as discussed earlier, while the perception of an illness is likely to vary among persons of different educational and income backgrounds, the reported length of an illness, conditional on an illness already being perceived, is likely to be less contaminated by respondent bias. Therefore, the reported length of an illness is a useful additional measure for analyzing health outcomes.

Since an illness episode in the relevant reference period is a dichotomous variable (assuming a value of one if the child was ill and zero otherwise), I estimate the relations for the probability of an illness episode during the preceding week and during the preceding three months by the maximum likelihood logit method (Table 4). Because Wald tests could not reject the hypothesis of equal coefficients for boys and girls, the data for both sexes were pooled in estimation. The gender dummy is not significant in either the one-week or the three-month recall-based equations.

Although, as discussed earlier, there is a significant under-reporting of morbidity with the three-month (relative to the one-week) recall method, both data methods yield fairly similar estimation results. A child's age is associated with lower probability of a reported illness episode, although whether this implies that younger children are at greater risk of infections or that parents are more sensitive to ill health of a younger child is impossible to know. Maternal schooling does not have a significant impact on reported illness episodes, probably because the effect of mother's schooling on *reporting* of child illness (which is likely to be positive) cancels out its effect on the true frequency of illness (which is likely to be negative). On the other hand, a household's per capita income has a strong *positive* effect on reported illnesses -- a surprising, although not entirely unexpected result, since it implies a strong income elasticity of reporting illnesses. Other household-level variables that have significant effects on reported morbidity are household size, which has a negative and significant effect, and urban residential status, which also has a negative effect (which is significant only with the 3-month recall data). The former result is suspect, since reporting of illnesses is likely to be strongly inversely related to family size. However, the result with respect to urban residential status is probably quite robust, since one would expect reporting of morbidity to be greater in urban than in rural areas.

Other findings include strong negative effects on morbidity of both all-weather road access and water access, and a negative (although not significant) morbidity effect of availability of piped drinking water. In the case of the 3-month recall data, the availability of modern health facilities has a significant negative effect on reported illnesses, but the availability of a locally resident health worker has a significant positive effect. All of these contradictory results underscore the problems of working with self-reported measures of morbidity. The analysis of self-

reported morbidity measures confounds the effects of exogenous variables on *true* morbidity with those on *reporting* of morbidity.

For this reason, it may be instructive to look at the reported length of an illness, conditional on an illness already being reported. As discussed earlier, this variable is less likely to be influenced by a respondent's income or educational status. By comparing the coefficients of the illness length equation with those of the illness episode equation, it may be possible to identify variables that have a significant effect on true (as opposed to reported) morbidity.

Since the length of an illness is a continuous, non-truncated variable, I estimate the illness length equation by ordinary least squares. This is one of the few equations where I could reject the hypothesis of equal coefficients for boys and girls. Hence, separate coefficients were estimated for boys and girls, by including a set of gender intercept and slope dummy variables. The results, also reported in Table 4, show that income does not have a significant effect on the reported length of an illness for either boys or girls. Interestingly, while schooling of the household head significantly reduces the reported length of an illness for boys, mother's schooling reduces (although not significantly) the reported length of an illness episode for girls. Thomas (1990b) observed the same phenomenon for Brazil, viz., that mother's schooling had a greater impact on girls' heights (relative to boys' heights) and father's schooling, on boys' heights.

Although household size was observed to have a significant effect on reported episodes of illness, it does not have a significant effect on the reported length of illness for boys or girls. This suggests that children do not necessarily fall ill less frequently in larger households but that their illnesses receive less attention and are not reported as often.

The effects of birth order on the reported length of an illness differ significantly for boys and for girls. Higher birth-order girls have shorter reported episodes of illness than lower birth-order girls, while in the case of boys the opposite relationship holds. This *may* point to a household preference for first-born sons but later-born daughters.

Some of the infrastructure variables also have differing effects on the reported length of illness episodes of boys and girls. Although water access, availability of good roads, and distance to the subdistrict town reduce the reported duration of illness episodes for boys, they do not have significant effects on the reported duration of girls' illnesscs. Similarly, while the availability of modern health facilities increases the reported length of illnesses for boys, it has no significant effect on the reported duration of girls' illnesses.

Weight-for-age provides another, more objective, measure of nutritional or health outcomes. I analyze the determinants of child weight, standardizing it by the median weight of a well-

nourished child of the same age and sex in the United States (NCHS, 1977). In addition, the health module of the 1987 SUSENAS survey reports the degree of malnutrition, if any, for each sample child under five, using the standard Gomez classification system (viz., whether the child is mildly, moderately, or severely malnourished). It is not clear what age-sex standards the SUSENAS survey used in order to determine the extent of malnutrition, but it appears the standards are not the NCHS standards but some Indonesian reference weights instead.

The standardized weight-for-age equation can be estimated by ordinary least squares (OLS) method. Since the degree of malnutrition has an ordinal ranking (0 for no, 1 for mild, 2 for moderate, and 3 for severe malnutrition), the ordered logit model is appropriate for analyzing the determinants of the degree of malnutrition. An F-test rejected the hypothesis of equal coefficients for boys and girls of the standardized OLS weight-for-age equation, but a Wald test could not reject such a hypothesis in the case of the ordered logit degree-of-malnutrition equation. The OLS weight-for-age equation was therefore estimated with a full set of slope dummy variables for gender. Estimates of both equations are reported in Table 5.

In the weight-for-age equation, only two individual coefficients are significantly different for boys and for girls. These are age and the availability of locally resident health workers. Interestingly, standardized weight declines with age for both boys and girls, which could imply that nutritional outcomes do actually worsen with a child's age. An alternative explanation would be that there are important differences in the growth curves for American and Indonesian children, so that the use of NCHS weight standards is inappropriate. The fact that the illness data do not show any positive relationship between age and reported morbidity or its length further supports the alternative explanation. However, the finding that, even after controlling for age, birth order has a significant negative impact on standardized weights adds to the evidence that households discriminate against higher birth-order children.

Resident health workers have a strong positive association with standardized weights for both boys and girls. The availability of an all-weather road also increases weight-for-age, while water access reduces standardized weights. The only surprising result is that the availability of piped drinking water is associated with lower standardized weights. It is interesting to note that piped drinking water availability is also inversely associated with a lower probability of child immunization. The fact that the reported occurrence and length of illnesses are actually reduced with the availability of piped drinking water supports the hypothesis that households (appropriately) view clean drinking water as a substitute for preventive care (viz.,

immunization) and child nutrition, so that increased availability of the former reduces their demand for the latter.

Most of the household-level variables have significant, anticipated impacts on standardized child weights. Mother's schooling and the schooling of the household head have positive (and almost equal) effects on weight-for-age, as does possession of a birth certificate and urban residence. Household income also has a significant, although numerically small (elasticity of .02), effect on standardized weight.

The estimated ordered logit equation for degree of malnutrition yields virtually identical results to the standardized weight equation. The only difference is that a Wald test could not reject the hypothesis of equal coefficients for boys and girls. The gender (intercept) dummy is significant and negative, indicating that, controlling for other factors, boys are at greater risk than girls of serious malnutrition. The risk of serious malnutrition is observed to increase with birth order, water access, and availability of piped drinking water, and to decrease with possession of birth certificate, mother's and head's schooling, household income, household size, urban residence, availability of resident health workers, and a good road. Controlling for other factors, children in Java, Bali, and Sumatra appear to have lower risk of malnutrition than children in the Outer Islands (which is consistent with the findings on reported morbidity).

It is possible to analyze directly the gender *difference* in standardized weights across households. Rewriting equation (1) separately for boys and girls we have

$$N_{ib} = a_b + bX_{ib} + cH_{ib} + dC_{ib} + \mu_{ib}, \quad (2)$$

and

$$N_{ig} = a_g + bX_{ig} + cH_{ig} + dC_{ig} + \mu_{ig}, \quad (3)$$

where i now indexes a household, and all variables are averages for boys and girls within a household. Taking the difference of (2) and (3), we have

$$\Delta N_i = (a_b - a_g) + b\Delta X_i + \Delta\mu_i, \quad (4)$$

where Δ is the difference operator (e.g., $\Delta N_i = N_{ib} - N_{ig}$). An advantage of the differenced equation is that it controls for all unobserved household and community effects in analyzing the determinants of gender differences in weight. The intercept of the differenced equation (4) can be interpreted as the difference in

Table 5
Determinants of Standardized Weight-for-Age and Degree of Malnutrition
Children under 5 Years,
Indonesia, 1987

Independent Variable	OLS Standardized Weight-for-Age				Ordered Logit Estimates of Degree of Malnutrition*	
	Girls		Boys			
	Coeff.	T-Ratio	Coeff.**	T-Ratio ***	Coeff.	T-Ratio
Intercept	63.483	30.3	54.588	-3.0	3.990	16.3
Possession of birth certificate	0.948	4.1	0.593	-1.1	-0.201	-7.6
Age (months)	-0.145	-23.0	-0.119	3.0	0.015	19.9
Whether child male					-0.218	-9.3
Birth order of child	-0.170	-2.8	-0.122	0.6	0.025	3.9
Mother's schooling years	0.122	2.9	0.170	0.8	-0.030	-6.1
Hh. head's schooling years	0.133	3.5	0.112	-0.4	-0.026	-5.9
Ln per-capita monthly income of hh.	1.829	9.0	2.147	1.1	-0.322	-13.6
Household size	0.162	2.8	0.164	0.0	-0.022	-3.3
Whether hh. residing in urban area	0.935	3.3	0.580	-0.9	-0.097	-2.9
Proportion of villages in kabupaten with:						
accessibility only by water	-1.213	-1.6	-1.840	-0.6	0.223	2.5
any modern health facilities	0.773	1.0	0.768	0.0	0.076	0.8
any resident health worker or physician	2.293	3.5	4.681	2.6	-0.709	-9.3
all-weather road	2.056	3.0	3.540	1.5	-0.444	-5.5
availability of piped drinking water	-3.458	-4.3	-3.697	-0.2	0.706	7.4
Avg distance from subdistrict town****	0.000	0.0	-0.016	-0.3	0.001	0.3
Dummy for Java or Bali	0.861	2.8	0.311	-1.3	0.095	-2.7
Dummy for Sumatra	0.025	0.1	-0.029	-0.1	-0.064	-2.0
F-test	87.315					
R-squared	0.093					
Mu(1)					2.199	113.8
Mu(2)					4.455	85.3
Log Likelihood Ratio					-27049	
Chi-squared (17)					27989	
No. of obs.	27,989					
F-test for equality of slope and coefficients across boys and girls	2.420					
Wald test for equality of all slope coefficients across boys and girls*****					18.062	

Notes:
* Degree of malnutrition is coded 0 for normal, 1 for mild, 2 for moderate, and 3 for severe malnutrition. The percentages of children in the four categories are 49.2, 39.5, 10.0 and 1.4 percent, respectively.
** These are the actual estimates for boys, and not the coefficients on the slope dummies.
*** The t-statistics in this column are for the slope dummy coefficients. The null hypothesis is that the coefficients for boys do not differ from those for girls.
**** Average for all villages in the kabupaten or district.
***** This is a chi-squared test with 16 degrees of freedom.

Table 6
Equations for the Gender Differential in Mean Standardized Weights within Households
Indonesia, 1987*

Independent Variable	Equation 1		Equation 2		Equation 3	
	Estimate	T-ratio	Estimate	T-ratio	Estimate	T-ratio
Intercept			-3.202	-7.3	-22.180	-2.4
Difference in age (months)**	0.412	28.1	0.410	28.2	0.437	16.6
Difference in birth order**	11.123	52.2	11.155	52.8	10.951	45.3
Difference in possession of birth certificate**	16.088	13.9	16.383	14.3	16.017	13.1
Mean age (months) of girls					0.055	1.2
Mean birth order of girls					-0.435	-1.7
Mean birth certificate existence for girls					-0.609	-0.6
Mother's schooling years					-0.113	-0.6
Hh. head's schooling years					0.088	0.5
Ln per capita monthly income of hh					1.309	1.4
Household size					0.247	1.0
Whether hh. residing in urban area					-1.413	-1.2
Proportion of villages in kabupaten with:						
accessibility only by water					0.088	0.0
any modern health facilities					1.898	0.6
any resident health worker or physician					6.471	2.3
all-weather road					1.627	0.6
availability of piped drinking water					-2.858	-0.8
Avg distance from subdistrict town***					-0.099	-0.7
Dummy for Java or Bali					-0.724	-0.5
Dummy for Sumatra					-0.543	-0.5
No. of obs.	3,304		3,304		3,304	
R-squared	0.556		0.562		0.565	
F-ratio	1,380		1,411		224	
F-test for significance of all non-differenced (i.e., levels variables) effects					1.32	

Notes: * The dependent variable is mean standardized weight for boys less that for girls. Weights are standardized for age and sex, using median NCHS (U.S.) standards.
** Difference in the mean value for boys and the mean value for girls within a household.
*** Average for all villages in the kabupaten or district.

standardized weights of boys and girls, after controlling for their age and birth-order differences.

Equation (4) is somewhat restrictive in that is assumes that boys and girls share the same coefficients b, c, and d. This assumption can be relaxed by allowing the coefficients of equations (2) and (3) to differ by gender:

$$N_{ib} = a_b + b_b X_{ib} + c_b H_{ib} + d_b C_{ib} + \mu_{ib}, \quad (2')$$

and

$$N_{ig} = a_g + b_g X_{ig} + c_g H_{ig} + d_g C_{ig} + \mu_{ig}, \quad (3')$$

Taking the difference of (2') and (3') and rearranging terms, one obtains:

$$\Delta N_i = (a_b - a_g) + b_b \Delta X_i + (b_b - b_g) X_{i} + c_b \Delta H_i + (c_b - c_g) H_{ig} + d_b \Delta C_i + (d_b - d_g) C_{ig} + \Delta \mu_i \quad (4')$$

Estimates of equation (4) and (4') are shown in Table 6. An F-test could not reject the hypothesis that all coefficients with the exception of $(a_b - a_g)$ and b_b in equation (4') are zero. Therefore, equation (4) is the appropriate model to consider. The estimates suggest that gender differences in standardized weight are strongly positively associated with gender differences in age, birth order, and possession of birth certificate. The significant negative intercept indicates that, even after controlling for gender differences in age, birth order, and birth-certificate possession, boys have significantly lower standardized weights than girls.

9. Conclusion

The picture that emerges from analysis of the SUSENAS health data on children is definitely *not* one of intrahousehold discrimination against girls. Indeed, if anything, a number of the indicators sugest that girls under five are favored relative to boys under five. For instance, the multinomial logit models for choice of curative treatment suggest that, even after controlling for other factors, boys have a lower probability than girls of receiving treatment, particularly from a modern health provider, for their illnesses. Boys also appear to have a lower *ceteris paribus* probability (relative to girls) of being immunized against preventable diseases, although this effect merely approaches statistical significance. Finally, household fixed-effects

estimates of standardized child weight (standardized by U.S. NCHS reference weights) that control for unobserved household characteristics and endowments also indicate that boys have significantly lower standardized weights than girls after controlling for gender differences in age and birth order.

In fact, the only sign of possible household discrimination against girls is the finding that boys have a lower *ceteris paribus* probability of being malnourished than girls. This finding is inconsistent with the result just discussed, viz., that boys have lower weights (relative to the U.S. NCHS standards) than girls. The incongruity of the two results suggests that the (unknown) Indonesian reference weights used by the Central Bureau of Statistics in order to determine the degree of child malnutrition are inappropriate. Therefore, the results indicating a greater degree of malnutrition among girls should be discounted.

Although the evidence on gender discrimination is weak and scattered, there is considerable indication in the empirical results of household discrimination against higher birth-order children. Controlling for age and gender, higher birth-order children have a significantly lower probability than lower birth-order children of receiving treatment from a modern health provider for their illnesses. They have longer reported lengths of illnesses (true particularly for boys), are less likely to be immunized, are more likely to be malnourished, and are breastfed for longer durations (and thus introduced to solid foods and breastmilk substitutes much later) than lower birth-order children. Thus, it appears that Indonesian households favor lower over higher birth-order children in the intrahousehold allocation of health inputs.

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Pro-Competitive Effects of Trade Reform: Results from a CGE Model of Cameroon

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1. Introduction

Disillusioned with the import-substitution policies of the past, an increasing number of developing countries are experimenting with trade liberalization. Concurrently, the present decade is witnessing an explosion of research on trade policy in imperfectly competitive environments. Although much of this work is theoretical and partial equilibrium in nature, and inspired by the problems of industrial countries,[1] it has greatly enhanced our ability to analyze trade policies in the presence of market imperfections of the type commonly encountered in the developing world. Indeed, market structures in developing countries exhibit just those features that have been the focus of

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[1] For a recent theoretical exposition, see Helpman and Krugman (1989). Empirical studies based on this literature are surveyed in Richardson.

the new academic literature: oligopolistic competition, entry and exit barriers, and unexploited scale economies.[2]

Nevertheless, trade reform in these countries continues to be evaluated within the perfectly competitive paradigm, with its robust case for liberalization. When oligopoly and returns to scale are mentioned, it is invariably to add a predictable sweetener regarding the pro-competitive and rationalization benefits of liberalization. Little serious analysis has been done to check whether these effects will work in the desired direction in the specific circumstances of developing countries.[3]

This paper therefore develops a general equilibrium model incorporating imperfect competition and increasing returns to scale, and applies it numerically to Cameroon to investigate the welfare and resource-allocation consequences of trade liberalization.[4] While Cameroon may not be the typical developing country which one would think of for this kind of exercise, we believe the results have some relevance to semi-industrial economies with much larger manufacturing bases. The model is in the tradition of applied general equilibrium models pioneered by Harris (1984), which pay special attention to details of market structure, firm entry and exit, and scale effects. It builds on an earlier version of the Cameroon model developed by Benjamin and Devarajan (1985).[5]

The model contains eleven sectors, six of which are treated as imperfectly competitive (all five manufacturing sectors plus one of the services, construction). We take capital as well as all categories of labor to be mobile across sectors; observed sectoral discrepancies in returns to capital in the oligopolistic sectors are attributed to excess profits. Imports and domestically produced goods are imperfect substitutes in demand. This means domestic firms retain some market power, even though -- as a small country -- Cameroon has no control over world prices. The level of excess profits, together with demand-side parameters, helps us calibrate the number of firms for each imperfectly competitive sector in the base equilibrium, assuming Cournot-Nash behavior. Increasing returns to scale, in turn, are modeled by attributing some of the firms' labor and capital payments to a fixed cost component that is independent of the scale of production.

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[2] See Rodrik (1988) for an overview.

[3] For some suggestive evidence in the Chilean case, see Tybout, de Melo, and Corbo (1989) and de Melo and Urata (1986).

[4] Some of our results were reported earlier in Devarajan and Rodrik (1989).

[5] See also Condon, Dahl, and Devarajan (1986).

Regarding the effects of trade liberalization, we conclude as follows: all of our experiments with an imperfectly competitive market structure indicate that the manufacturing sector as a whole *expands*, to the detriment of agriculture in general and the cash crops sector in particular. This stands in sharp contrast with what may have been expected in a country at Cameroon's level of development, as well as with the results of the model in the presence of *perfect* competition. Moreover, these results are insensitive to the ease with which firms can enter and exit industries. The number of firms that move tends to be small when such movement is allowed. Welfare effects are positive but not overwhelming, amounting to around 2% of GNP. In the absence of economies of scale, these effects are considerably smaller. Significantly, we find evidence that the presence of imperfect competition *enhances* the benefits of trade liberalization. Once again, firm entry and exit play only a small role: allowing free entry and exit enhances the welfare benefits of liberalization, but not greatly so.

The behavior of the manufacturing sectors is the key determinant of these results, since it is in these sectors that we face potential conflicts in policy objectives. To see this, consider the consequences of a small perturbation in an economy characterized by a number of important distortions: imperfect competition, increasing returns to scale, wage differentials in favor of modern industries, and, not least, trade protection. The real-income effect of such a perturbation can be decomposed in the following manner (see Rodrik, 1988):

$$dy = \Sigma(p_i - p_i^*)dM_i + \Sigma(p_i - AC_i)dX_i + \Sigma n_i AC_i[1 - (1/s_i)]dx_i + \Sigma(w_i - \bar{w})dL_i, \quad (1)$$

where i indexes sectors, p and p^* are the domestic and world prices, M, X, and L are the quantities of net imports, output, and employment, AC is the average cost, n the number of firms, s the ratio of average to marginal costs, x the output of the representative firm in a given sector, and w_i and $\bar{w}$ the sectoral and economy-wide average wages. Each of the terms on the right-hand side picks up the effects of a distinct distortion. In an otherwise undistorted economy, trade reform would be welfare increasing by spurring imports in sectors where domestic prices are kept above world price, as is shown by the first term. In standard models with perfect competition, this would have the implication of the domestic manufacturing sectors contracting along their supply curves as domestic prices of imports and import substitutes fell.

But the second and third terms in the equation suggest that this may be a mixed blessing: as the repository of excess profits

and unexploited scale economies (second and third terms, respectively), these manufacturing sectors are already operating at too small a scale from the perspective of these two features. Since excess profits and scale economies imply that prices exceed average costs, which in turn exceed marginal costs, it is desirable for manufacturing to *expand* on account of these imperfections. This conflict is at the heart of the fundamental indeterminacy regarding the welfare benefits of trade liberalization in the presence of imperfect competition. It creates the possibility that liberalization will deteriorate welfare by squeezing those manufacturing firms that are already operating at sub-optimal capacity. In our model, this conflict is aggravated by the presence of an important labor-market distortion (picked up by the last term in the equation). As is common in developing countries, wage levels for similar types of labor are generally higher in the manufacturing sectors than in the rest of the economy. This creates an additional reason why manufacturing output is sub-optimal.

The Harris (1984) model mentioned above demonstrates an attractive way out of this dilemma. Assume that firms can freely enter and exit industries, as profitability conditions change. Then trade liberalization will reduce the number of firms in the protected manufacturing sectors that come under pressure, helping the remaining firms achieve greater scale economies.[6] The rationalization of industry in this fashion renders compatible the goals of higher imports and expanded domestic production lines. In fact, the productivity improvements that come about as the remaining firms travel down their average cost curves can be large enough to stimulate the growth of the manufacturing sector as a whole, greatly amplifying the efficiency benefits of liberalization. Although Harris' study was of Canada, a recent paper by Gunasekera and Tyers (1989) obtains a similar outcome in an advanced developing country, South Korea.

Imperfect competition does not stand in the way of welfare gains in our model either. But the mechanism at work is different from that considered by Harris, since free entry and exit do not materially affect our results. Instead, we find that liberalization has an output-expanding *pro-competitive* effect in key manufacturing industries: as import competition stiffens, domestic firms' market power erodes, stimulating them to expand production. In more technical terms, the (perceived) marginal revenue curve faced by domestic firms becomes flatter, thereby

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[6] In terms of equation (1), note that the second and third terms can be combined to read $\Sigma(p_i - MC_i)dX_i + \Sigma AC_i x_i[(1/s_i) - 1]dn_i$. For some qualifications on rationalizations, see Brown and Stern (1989).

diminishing the previous incentive to withhold sales to prop up prices. In many manufacturing sectors, this effect outweighs the greater market share now enjoyed by imports (i.e., the inward shift in the demand curve faced by firms) and leads to an expansion of output. This pro-competitive effect operates even in the absence of entry and exit, which explains the relatively small role played by firm mobility in our model compared with Harris (1984) and other models in the same spirit.

While the pro-competitive effect is recognized in policy discussions, ours is the only applied general equilibrium study in which it emerges as the centerpiece. Our results provide some justification for remaining sanguine about the effects of trade liberalization in the imperfectly competitive environments characterizing developing countries. Since the industry rationalization effect relies on firm mobility, it could be short-circuited in many developing economies where weak financial markets create frictions in entry and exit. The pro-competitive effect therefore represents an important channel through which trade liberalization can become compatible with desirable expansion in the manufacturing sector, even in the absence of industry rationalization.

2. The Cameroonian Economy, Data and Model Specification

After a brief description of the structure of the Cameroonian economy, this section documents the calibration procedure used and the adjustments made to the computable general equilibrium (CGE) model of Cameroon to incorporate imperfect competition and scale economies. A complete statement of the model is given in the Appendix.

2.1 The Cameroonian economy

This paper is based on data from the Republic of Cameroon in 1980. One of the wealthier countries in Sub-Saharan Africa (its per capita income in 1986 was $900), Cameroon represents an ideal case for a prototypical study like ours. Like most developing countries at its stage in development, Cameroon is primarily an agricultural economy with over 70% of the population employed in agriculture. In 1980, this sector also provided the lion's share of foreign exchange to the economy, mainly from exports of cash crops -- coffee and cocoa (Table 1). The industrial sector, which has grown rapidly since independence (albeit from a tiny base), processes Cameroon's natural resources and produces some light consumer goods. This sector has enjoyed protection from import competition. The pattern of protection is reflective of most

developing countries: high tariffs on food processing and consumer goods and lower ones on intermediate and capital goods (Table 1). Furthermore, imports and domestically produced goods in the same sector are not perfect substitutes in demand. The elasticity of substitution between the two is higher for consumer goods and processed foods, and lower for producer goods. Finally, there is evidence that the industrial sector, unlike the agricultural sector, is characterized by imperfect competition and economies of scale. The resource-based industries require

Table 1
The Cameroonian Economy, 1979-80

Sectors	1979-80 Net trade[a] (billions of CFA Francs)	Export/ production ratio (%)	Imports/ domestically produced supply ratio (%)	Elasticity of substitution between imports and domestic goods[b]	Tariff rate (%)[c]
Food crops	2.133	1.39	0	1.5	22.1
Cash crops	117.026	95.14	10.0	0.9	23.3
Forestry	22.314	75.71	0	0.4	27.8
Food processing	5.49	32.56	24.9	1.25	35.3
Consumer goods	-31.198	4.95	31.3	1.25	38.3
Intermediate goods	-37.241	35.63	48.7	0.5	17.7
Cement & base metals	-39.115	30.73	145.2	0.5	26.3
Capital goods	-130.881	37.27	1,308.0	0.75	26.8
Construction	0	0	-	-	-
Private services	7.187	13.26	12.1	0.4	0
Public services	0	0	-	-	-

Notes: a $1 - 210 CFA Francs b Assumed values
c Effective tariff rate, calculated as the ratio of tariff revenues to import values.

high fixed investments in plant and equipment. Consequently, some of the sub-sectors consist of only a few firms. Cameroon's

industrial policy in the 1960s, based on building large, state-owned enterprises, also led to an imperfectly competitive market structure in many industries.

This textbook-like pattern of development was severely jolted in the 1980s when Cameroon became an oil exporter. The impact of oil revenues on the real exchange rate and competitiveness of the traditional tradable sectors (the "Dutch disease") has prompted the government to reconsider its development strategy.[7] Since 1986 in particular, the issue of alternative sources of foreign exchange has become important as oil prices and Cameroon's reserves have declined. On the agenda for the post-oil era is trade liberalization, as part of a more "outward oriented" development strategy. Hence, the question we ask in this paper, "What are the consequences of trade liberalization for an economy that exhibits the characteristics of Cameroon?" is of interest to the country itself.

2.2 Calibration procedure

Despite the anecdotal evidence, hard data on market structure and the degree of economies of scale in Cameroon are difficult to come by. Yet this information is necessary if we are to simulate the effects of trade liberalization in the presence of these factors in Cameroon. We now describe the calibration procedure used to derive the benchmark equilibrium given the data that we *do* have on Cameroon.

For the six oligopolistic sectors, we observe[8] capital and labor inputs in physical terms, their prices, and, in values, inter-industry purchases, domestic sales, and export sales. We then make the following simplifying assumptions:

a) All production functions are Cobb-Douglas in labor and capital inputs and Leontief (fixed coefficients) in intermediate inputs.

b) Capital earns a uniform rate of return in the benchmark year of 5%. In the oligopolistic sectors, any excess of revenues over wage, capital, and intermediate costs is treated as excess profits; in the other sectors, the excess is attributed to a sector-specific factor of production.

c) The representative household in the economy has a Cobb-Douglas utility function (giving rise to a linear demand system) over composite goods, which in turn are a CES aggregate defined over imported and domestically produced commodities. Domestically produced goods within a composite good are taken

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[7] For a discussion of the impact of oil revenues on the Cameroonian economy, see Benjamin et al. (1987)

[8] The details of how these were derived are given in Benjamin and Devarajan (1983).

to be perfect substitutes for each other.[9] This gives rise to a market demand elasticity for the domestic good that is calculated as:

$$\varepsilon = -\left\{\sigma + (1-\sigma)\frac{\delta^{-\sigma}(P^d)^{1-\sigma}}{(1-\delta)^{-\sigma}(P^m)^{1-\sigma} + \delta^{-\sigma}(P^d)^{1-\sigma}}\right\} \quad (2.1)$$

where σ is the elasticity of substitution between imports and domestically produced substitutes (Armington elasticity), and P^d and P^m are the prices of domestic goods and imports, respectively.[10] The demand elasticity is calculated as the percentage change in domestic demand for the domestic good in response to a unit percentage increase in P^d, while holding all domestic expenditures on the relevant *composite* commodity (i.e., the CES aggregate) fixed.

Inspection of equation (2.1) shows that ε increases in absolute value whenever the relative price of imports (P^m/P^d) falls. This plays an important role in the analysis, as it implies that domestic firms will behave more competitively as a consequence of trade liberalization. Although the relationship between the demand elasticity and the relative price of imports is a direct consequence of our CES demand system, we believe it captures an important feature of reality, especially in the presence of quantitative restrictions.

d) The oligopolistic firms behave in a Cournot-Nash fashion. Under this hypothesis, the firms' perceived demand elasticity for domestic sales is N_ε, where N is the number of firms in that sector.[11] For export sales, the demand elasticity in each sector is set equal to -20, reflecting Cameroon's minuscule market power in world markets. Below, we report on sensitivity analysis with this parameter.

Armed with these assumptions, the data described above, and normalizing the prices of imports and domestic goods at unity, we solve the following system of simultaneous equations for all oligopolistic sectors simultaneously.

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[9] This differs from Harris (1984) and other models in the same spirit where domestic firms are assumed to be producing imperfect substitutes.

[10] The values for σ are given in Table 1.

[11] In Harris-type models, it is customary to treat the firms' perceived demand elasticity as a constant in the short-run solution. As equation (2.1) makes clear, in our case, this elasticity varies with changes in the relative price of imports.

$$MC = (1/A) \prod_{m=1}^{3} (w_m/\alpha_m)^{\alpha_m} \cdot \left(rP^k/\alpha_k\right)^{\alpha_k} + \sum_j INT_j/(N \cdot X) \tag{2.2}$$

$$\sum_m W_m L_m + rP^k K = N \cdot MC \cdot X - \sum_j INT_j \tag{2.3}$$

$$\frac{P^d(1-t^d) - MC}{P^d(1-t^d)} = \frac{-1}{N \cdot \varepsilon} \tag{2.4}$$

$$\frac{P^e(1-t^d) - MC}{P^e(1-t^d)} = \frac{-1}{N \cdot \eta} \tag{2.5}$$

$$P^e \cdot E \cdot N = ESALES \tag{2.6}$$

$$P^d \cdot D \cdot N = DSALES \tag{2.7}$$

$$X = D + E \tag{2.8}$$

where

MC = marginal cost*
W_m = wage of labor group m (derived from data)
r = Return to capital (assumed to be 0.05)
INT_j = intermediate input purchase of sector j's output
A = technology parameter in production function*
L_m = input of labor group m
K = capital stock
N = number of firms*
X = output per firm*
Pd = domestic sale price
Pk = price of capital goods
td = indirect tax rate
P^e = export sale price*
η = export demand elasticity
E = exports per firm*
D = domestic sales per firm*
$ESALES$ = value of export sales (from data)
$DSALES$ = value of domestic sales (from data)

(* Denotes the seven endogenous variables in this calibration exercise.)

The solution gives us, inter alia, the base year values of output, domestic sales, exports, number of firms, and excess profits that are consistent with the assumptions and observed data for Cameroon in 1980. The number of firms is an important figure because it is held fixed in the experiments where we assume no entry or exit. As we assume Cournot behavior, we should think of it as the Cournot-equivalent number of firms, rather than the actual number. Similarly, in some simulations allowing for free entry and exit, the level of excess profits is held fixed at its benchmark value. Table 2(a) shows the calibrated values for the relevant variables.

Table 2
Calibration Results

(a) Constant Returns to Scale (s=1)

Sector	Output per firm (billion CFAF)	Exports per firm (billion CFAF)	Number of firms*	Industry profits (billion CFAF)	Marginal cost (CFAF)
Food processing	3.9		19	2.4	0.9
Consumer goods	13.7	1.3	9	11.0	0.8
Intermediate goods	3.3	0.7	87	2.7	1.0
Cement/ base metals	1.7	1.2	20	1.4	0.9
Capital goods	0.8	0.5	13	1.1	0.8
Construction	18.1	0.3	10	17.5	0.9

(b) Increasing Returns to Scale (s=1.25)

Sector	Output per firm	Exports per firm	Number of firms*	Industry profits	Marginal cost
Food processing	29.1	12.0	3	2.4	0.6
Consumer goods	38.0	2.6	3	11.0	0.6
Intermediate goods	81.6	36.2	4	2.7	0.7
Cement/base metal	10.8	4.3	4	1.4	0.7
Capital goods	2.6	1.3	5	1.1	0.5
Construction	49.3	-	4	17.5	0.7

*Rounded to a whole number

Until now, we have been considering a production technology that exhibits constant returns to scale. To incorporate increasing returns to scale, we assume that these stem from a fixed cost component to the cost function (as in Harris, 1984). Thus, the total cost (TC) is now made up of a fixed cost (FC) and a marginal cost component that does not depend on the level of firm output:

$$TC = FC + MC \cdot X$$

The fixed cost is made up of labor and capital costs in the same proportion as in total value added. To calibrate the level of these fixed inputs (and hence the degree of increasing returns), we assume an initial level of the scale parameter s, the ratio of average to marginal cost:

$$s = AC(X)/MC.$$

Given s, the fixed costs (and the implied fixed labor and capital inputs) can be calculated from:

$$FC = MC(s - 1)X$$

The scale parameter s is fixed only in the calibration. It varies across simulations, as firm output, factor costs, and input prices change. Table 2(b) shows the calibration results for the same variables as in Table 2(a), assuming s-1.25 across all oligopolistic sectors. Note that the number of firms is much smaller in the calibration. This is because marginal cost is lower in the presence of fixed costs. This higher price-cost margin implies a more collusive industry, i.e., one with fewer firms.

2.3 Model specification

The calibration equations (2.2) minus (2.8) form part of the model that is used to analyze the impact of trade liberalization. The rest of the model, including the behavior of the competitive sectors, is a fairly standard CGE model. The equations are given in the Appendix. Here, we describe the model's salient features:

a) Differentiation between imports and domestic goods by sector: As mentioned earlier, consumers have CES utility functions over imports and domestically produced goods in the same sector. Thus, oligopolistic domestic producers enjoy a certain amount of market power, although Cameroon is a price-taker in the world market for competitive imports in those industries.

b) Differentiation between Cameroonian exports and other exports: We assume Cameroon faces a constant elasticity demand function for its exports. However, since we set the demand elasticity at -20, this is extremely close to the "small country" assumption in exports. As mentioned earlier, in our simulations, we test the robustness of our results to the value of this parameter.

c) Profit maximization by individual producers: For the competitive sectors, this implies setting the wage equal to the value of the marginal product of each of the three labor groups and for capital, with price taken as given. In the oligopolistic sectors, the analogues are equations for the price-cost margin (2.4) and for marginal cost (2.2). The perceived demand elasticity used to calculate the price-cost margin for each firm is endogenous and depends, inter alia, on relative prices in that sector (see equation (2.1). Thus, each firm's conjectured price-cost margin in equation (2.4) is consistent with the actual margin that is obtained in equilibrium. The production functions are all Cobb-Douglas. In the case of economies of scale, the production function is altered to incorporate fixed inputs of labor and capital. If the original production function was f(K,L), it is now g(K - K*, L - L*), where K* and L* are the fixed amounts of labor and capital required to start production. The cost of these fixed inputs is the fixed-cost component of the total cost.

d) Utility maximization by consumers: The single representative household in this economy maximizes a nested utility function. At the top level, it is a Cobb-Douglas utility function (implying constant expenditure shares) over "composite goods." These composite goods are then divided between imports and domestic goods according to a CES utility function.

e) Market-clearing: There is a full employment of the three categories of labor (rural, urban unskilled, and urban skilled) and of mobile capital. Demand and supply of domestic goods in each sector are equilibrated.

f) Labor markets: There are three labor markets, one for each category of labor. In any given category, labor is mobile across all sectors and the wage for that category clears the labor market. However, workers in the same category do not earn the same wage in each sector. In the benchmark data, the wage bill divided by employment reveals that the wage is not equal across sectors (for the same category). We attribute the difference between these wage payments to sector-specific characteristics, but assume they are a fixed fraction of the (endogenous) wage in that category. Thus, the actual payment to workers in skill category m by sector i is $W = W_m \cdot WDIST_{mi}$, where W_m is the endogenous wage and $WDIST_{mi}$ is the coefficient representing sector-specific characteristics.

Table 3 shows the values of $WDIST_{mi}$ in the model. Note that the values are higher for the industrial sectors and lowest for

the cash crops sector. This will play a role in interpreting the simulation results of Section 3. Naturally, differential wage paid to workers in the same labor market represents a distortion. A policy change that shifts workers form low- to high-paying sectors will therefore improve welfare. Note also that we will keep these premia constant across experiments; there are many reasons to expect that their levels would be affected by trade reform. These wage differentials may also reflect skill-mix differences not captured by our threefold classification. But given the importance of distortionary wage differentials even in advanced countries, we believe these indicate the presence of a real distortion.

Table 3
Sectoral Premia on Wages

Sector	Rural	Urban unskilled	Urban skilled
Food Crops	1.02	.71	-
Cash Crops	.50	.34	.29
Forestry	3.26	2.29	1.92
Food processing	1.46	1.02	.86
Consumer goods	1.13	.80	.67
Intermediate goods	3.11	2.18	1.83
Cement/base metals	6.32	4.44	3.73
Capital goods	2.50	1.76	1.48
Construction	2.92	2.05	1.72
Private services	1.40	.99	.83
Public services	1.33	1.11	-

g) Government: Government earns revenue from trade and indirect taxes, buys a fixed amount (in real terms) of goods as current expenditure, and contributes the difference to a common pool of investable resources. One of the sources of government revenue is a lump-sum tax on households, set initially at zero, which is used to make up the revenue lost from trade liberalization. In this way, the revenue effects of trade liberalization do not affect the welfare calculations reported below.

h) Savings investment: In addition to government savings, households save a fixed fraction of their disposable income, and

the current account deficit is financed by foreign savings (assumed fixed in dollars). The total is equated to the level of investment, which is also fixed in real terms by sector (to avoid the intrusion of intertemporal considerations into our welfare analysis).

i) Closure rule: From the above, the closure rule is one where the economy's total saving and investment are kept fixed at their initial levels, by appropriate adjustments in the lump-sum tax.

j) Numeraire: The numeraire is the nominal exchange rate, or equivalently, the (exogenous) world price of imports.

3. Policy Experiments

We now discuss the results of a series of experiments with trade liberalization. Unless otherwise specified, all liberalization experiments involve the elimination of import tariffs across the board. To build intuition about the way the model works, we will proceed in stages. First we discuss the results when all sectors operate under constant returns to scale and there is not firm entry and exit. To see the difference made by imperfect competition, these results are compared with those of an alternative experiment in which all firms are assumed to act competitively. We then move to the case where the imperfectly competitive sectors are also subject to increasing returns to scale (while the number of firms remains fixed). Next, we allow firms to enter and exit in response to changes in sectoral profitability. We end by commenting briefly on the income distributional effects of liberalization under imperfect competition.

3.1 Constant returns to scale

The results of trade liberalization in the absence of increasing returns to scale are summarized in Table 4. The first part of the table, (a), shows the outcome when "excess profits" are treated as rents accruing to sector-specific factors of production, and the firms in each sector are assumed to behave competitively. This establishes a benchmark for comparing the results in the second part of the table, where oligopolistic competition is allowed along the lines sketched earlier.

Table 4
Results with Constant Returns to Scale

(a) Perfect Competition

Sector	Output		Imports (volume)		Exports (volume)		Profits	
	Base level	% change	Base level	% change	Base level	% change	Base level	% change
Food crops	330.5	-3.2	2.5	28.0	4.6	-1.3	-	-
Cash crops	131.5	14.3	8.0	14.1	125.1	14.7	-	-
Forestry	29.5	3.6	-	-	22.3	3.1	-	-
Food processing	72.0	1.9	18.0	32.1	23.5	7.8	-	-
Consumer goods	118.4	-2.6	37.1	36.9	5.9	3.1	-	-
Intermediate goods	284.4	5.4	138.6	7.6	101.3	8.3	-	-
Cement/base metals	34.2	-2.1	49.6	3.3	10.5	4.0	-	-
Capital goods	10.3	-3.2	134.7	2.6	3.8	-1.6	-	-
Construction	174.1	-0.8	-	-	-	-	-	-
Private services	615.8	-0.9	74.4	-1.2	81.6	-0.7	-	-
Public services	164.0	-0.4	-	-	-	-	-	-

Sector	Percentage changes			
	Consumer prices	Producer prices	Prices of VA	Marginal costs
Food Crops	-1.4	-1.3	-1.1	-1.3
Cash Crops	-15.3	-1.1	3.5	-1.1
Forestry	4.7	1.0	3.0	1.0
Food processing	-12.7	-4.7	-0.0	-4.7
Consumer goods	-11.2	-4.6	-2.1	-4.6
Intermediate goods	-11.4	-5.6	-0.5	-5.6
Cement/base metals	-17.9	-8.0	-0.8	-8.0
Capital goods	-20.5	-4.0	-0.8	-4.0
Construction	-6.5	-6.5	-1.2	-6.5
Private services	-0.6	-0.6	-0.2	-0.6
Public services	-1.1	-1.1	0.4	-1.1

Increase in welfare (%): 0.0 (0.049)

Table 4
Results with Constant Returns to Scale

(b) Imperfect Competition

Sector	Output		Imports (volume)		Exports (volume)		Profits	
	Base level	% change	Base level	% change	Base level	% change	Base level	% change
Food crops	330.5	-0.6	2.5	35.8	4.6	-1.7	-	-
Cash crops	131.5	-4.5	8.0	13.2	125.1	-4.4	-	-
Forestry	29.5	4.6	-	-	22.3	2.2	-	-
Food processing	73.1	11.9	18.0	40.6	24.6	38.6	2.4	-2.6
Consumer goods	119.1	-2.2	37.1	44.4	6.5	11.3	11.0	-3.7
Intermediate goods	285.9	12.7	138.6	11.9	102.7	28.4	2.7	1.9
Cement/base metals	34.8	45.1	49.6	15.0	11.1	141.7	1.4	-2.4
Capital goods	11.1	-0.4	134.7	3.9	4.6	6.5	1.1	-6.5
Construction	176.8	0.0	-	-	-	-	17.5	-3.2
Private services	615.8	-1.2	74.4	0.6	74.4	-2.6	-	-
Public services	164.0	-0.3	-	-	-	-	-	-

Sector	Percentage changes			
	Consumer prices	Producer prices	Prices of VA	Marginal costs
Food Crops	0.7	0.9	1.0	0.9
Cash Crops	-11.4	0.1	1.0	0.2
Forestry	23.9	6.0	8.5	6.0
Food processing	-9.1	-2.0	4.7	-1.6
Consumer goods	-8.3	-0.7	3.3	-0.5
Intermediate goods	-7.3	-1.3	4.8	-1.2
Cement/base metals	-15.8	-5.5	4.6	-4.3
Capital goods	-20.2	-0.9	4.0	-0.3
Construction	-3.2	-3.2	3.7	-3.2
Private services	3.7	3.7	4.2	3.7
Public services	3.5	3.5	5.2	3.5

Increase in welfare (%): 1.1

Liberalization greatly spurs imports in both experiments. As a result, consumer and producer prices are reduced in all the manufacturing sectors. Notice, however, that trade liberalization has practically no effect on aggregate welfare costs of wage differentials by pulling labor away from high wage sectors.[12] The net welfare effect is a wash. Under imperfect competition, by contrast, welfare is increased by 1.1%[13] The welfare consequences under the two scenarios cannot be directly compared since the assumption of additional sector-specific factors of production in the first scenario renders the production structure more rigid and reduces the potential gains from trade. But that is only part of the story behind the difference in welfare effects.

The other part is that resource-allocation patterns greatly differ in the two experiments. In the competitive benchmark, the main beneficiary of trade liberalization is the cash crops sector, the output of which increases by 14%. The manufacturing sector as a whole loses out, with relatively large production cuts in consumer goods, cement and base metals, and capital goods. This picture is consistent with the expected pattern of comparative advantage for a country at Cameroon's level of development. However, when we allow imperfect competition, the manufacturing sector ends up as the *beneficiary* of liberalization. The cash crops sector now *contracts* by 5%, while the output of good processing, intermediate goods, and especially cement and base metals industries receive a sizable boost. The declines in the two contracting manufacturing sectors (consumer goods and capital goods) are small and less pronounced than before.

The expansion of the manufacturing sector goes hand in hand with a squeeze on excess profits. As Table 4(b) shows, the aggregate levels of excess profit decline in all but the intermediate goods sector. The latter is spared because it is the sector least protected by the pre-existing tariff structure (see Table 2), and prima facie the one most favored by liberalization. Even in this case, the proportional increase in profits falls far short of that in output, so that profits normalized by the output level are now lower. The gap between producer prices and marginal costs is therefore reduced in all of the five manufacturing sectors.

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12 The evidence from this statement comes from an experiment in which wage differentials are assumed away. Trade liberalization then increases welfare by 0.6% in the competitive case.

13 Note that since consumers have a well-defined utility function in this model (and since real government and investment spending is held constant), welfare effects can be measured by using this utility function directly.

The profit squeeze in the manufacturing sector is a natural and expected consequence of intensified import competition. But how can we explain the simultaneous expansion of manufacturing? Under perfect competition, trade liberalization would be expected to reduce domestic production in the most heavily protected sectors (as indeed it does). Under imperfect competition this conclusion is not pre-ordained since domestic firms do not have a well-defined supply curve along which they respond to market price. In fact, to the extent that liberalization flattens the marginal revenue curve faced by domestic firms, it spurs production. This can be appropriately termed the "pro-competitive" effect of trade liberalization, as it pushes domestic firms to behave in a more competitive manner - i.e., to close the gap between price and marginal cost and expand output.

To see what is going on here, it is useful to spend a moment on the implications of liberalization for the first-order condition of the typical, imperfectly competitive firm. To keep the explanation as transparent as possible, let us abstract from interactions among the domestic oligopolists, and concentrate on a single import-competing monopolist at home. Prior to liberalization, the firm's first-order condition is given by:

$$(3.1) \quad (p_0 - c) + q_0 p_0' = 0,$$

where the subscript 0 refers to the base values of price and quantity, and p_0' (<0) stands for the derivative of the inverse demand curve evaluated at the initial level of production. For simplicity, marginal costs (c) are taken to be constant. After liberalization, we have the analogous expression:

$$(3.2) \quad (p_1 - c) + q_1 p_1' = 0.$$

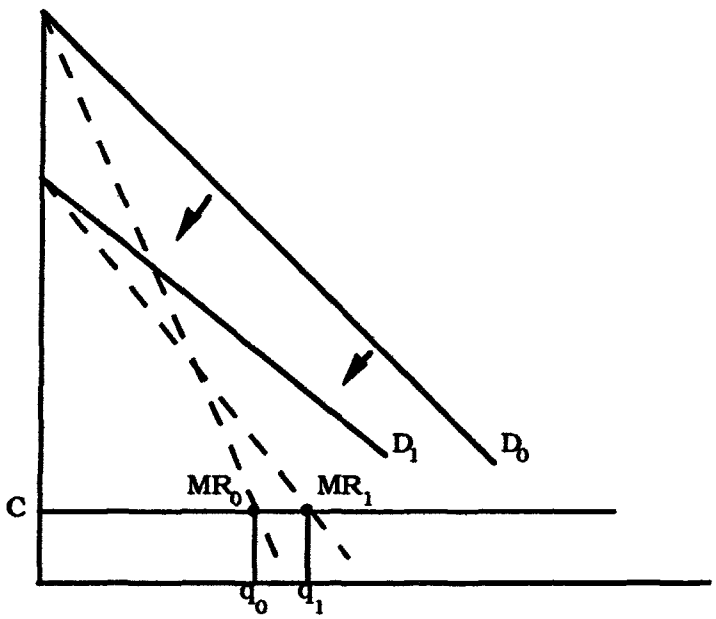
Subtracting the first of these equations from the second and adding and subtracting $q_0 p_1'$, we get:

$$(3.3) \quad (p_0 - p_1) = q_0(p_1' - p_0') + p_1'(q_1 - q_0).$$

Consider the consequences of a reduction in the monopolist's price, as will happen when tariff liberalization shifts the monopolist's demand curve inward. Equation (3.3) expresses the necessary correlates of such a price reduction. Since the left-hand side is negative under this scenario, the right-hand side must be negative also. Now when the slope of the demand curve remains unchanged in the new equilibrium, the output consequences can be read off easily: $(p_1' - p_0') = 0$, implying $(q_1 - q_0) < 0$ (since $p_1' < 0$). That is, the monopolist will respond to

the inward shift in demand by reducing output whenever the shift does not affect the slope of the demand curve. Intensified import competition can have a second effect on the domestic firm's demand curve beyond shifting it inward: it can change its slope and make it flatter. This is what happens in our model as import liberalization renders the demand faced by domestic firms more elastic. In terms of the equations above, this corresponds to a reduction (in absolute value) in the magnitude of the derivative of the inverse demand curve, i.e., $(p_1' - p_0') > 0$. It follows that the negative effect on firm output will be alleviated. Moreover, if the change in the slope of the demand curve is large enough, equation (3.3) will require that the domestic firm's output *increase* (i.e., $q1 - q0 > 0$). This is illustrated in Figure 1.

Figure 1



This is what is at work in the results reported above. While the demand curve does shift inward, the change in its curvature in the new equilibrium is enough to offset the adverse effect on firms' output. Domestic firms now perceive themselves as having much less control over their prices, and hence increase production (or contract less than before).

To test the sensitivity of our results to the degree of substitutability between imports and domestic goods, we also ran the model with the Armington elasticity (σ) raised to 5.0 in all sectors. The output results of this run are reported in Table 4(c).

Table 4
(c) Output Results under Imperfect Competition and Constant Returns to Scale with Armington Elasticity (σ) Raised to 5.0 for All Tradable Sectors

Sector	Percent change in output	Sector	Percent change in output
Food crops	-2.0	Cement/base metals	57.8
Cash crops	3.7		
Forestry	8.0	Capital goods	-8.2
Food processing	15.7	Construction	0.7
Consumer goods	-23.6	Private services	-
Intermediate goods	20.0	Public services	-0.1

Note that the relationship between σ and the change in demand elasticity is ambiguous and complex (as can be seen by examining equation (2.1). But when imports become closer substitutes for domestic goods, the inward shift in the demand curve facing domestic firms following liberalization is magnified. On this account alone, we would expect the resource pulls to be less favorable to the heavily protected sectors. This is generally borne out in Table 4(c): note in particular that the cash crops sector now expands. Therefore, greater substitutability of imports for domestic goods blunts the output-expanding effect of liberalization in the modern sectors.

3.2 Increasing returns to scale

We now turn to the results of the same policy experiment when firms in the imperfectly competitive sectors also operate under increasing returns to scale (IRS). Our approach in calibrating the level of IRS is ad hoc, but necessarily so. Very little solid information exists on the scale characteristics of technology in countries like Cameroon, so we are forced to take a short cut. As explained above, we first break total primary-factor costs into two components, fixed and variable costs. The latter are assumed to be linear in the level of production, while the former are independent of scale of the operation, which gives us decreasing *average* costs. We attribute 20% of total costs in the base calibration to fixed costs, which appears to be a reasonable benchmark from which to assess the impact of IRS. This yields a scale parameter s (the ratio of average to marginal cost) of 1.25 in the initial equilibrium. Note that s will change as a consequence of any shock to the economic system, to the extent that relative

prices and firms' scale of output are affected. We expect the gains for trade liberalization to be magnified to the extent that firms travel down their average cost curves, i.e., s is reduced.

The results of trade liberalization under IRS are displayed in Table 5. In terms of resource pulls, the main difference with the earlier experiment is the much greater responsiveness of the expanding manufacturing sectors: food products expand by 26% (previously 12%), intermediate goods by 21% (previously 13%), and cement and base metals by 109% (previously 45%). This magnification comes from the reduction in unit costs (or alternatively, increase in factor productivity) as the scale of output expands. This is borne out by the reduction in s in each of these three sectors. Note also that the contraction of the food crops sector is now reversed, while the cash crops sector receives an even greater squeeze. In fact, the latter sector is the predominant source of the resources released to manufacturing. From the perspective of the traditional tenets of comparative advantage, this is a rather unusual outcome.

The introduction of IRS also magnifies the consequences for the level of excess profits. Four of the imperfectly competitive sectors (food processing, consumer goods, capital goods, and construction) now suffer a reduction in the aggregate level of excess profits by 10 to 30%. Meanwhile, the cement and base metals sector receives a large boost.

With the introduction of IRS, the positive welfare effect of liberalization is almost doubled, rising from 1.1% (of base welfare) to 2.0%. This is in large part due to the beneficial scale effects of liberalization. There are relatively large reductions in unexploited scale economies in the food products, intermediate goods, and cement and base metals sectors, as captured by the fall in s in these sectors. The increases in s in the other three sectors with IRS are comparatively small. Also, recall from Section 2 that the introduction of a fixed cost drives a greater wedge between prices and marginal costs (so that we can remain consistent with observed data on revenue and total costs). Since the oligopolistic sectors tend to expand, the welfare benefits are magnified.

One reason why our welfare gains may be biased downwards is our specification of export demand. Recall that we assume Cameroon faces an export demand elasticity of -20, reflecting a small -- but not negligible -- amount of market power. This implies that, in an otherwise undistorted economy, welfare would increase with the levying of a 5% export tax. Hence, setting tariffs at zero will not be welfare-maximizing because of these induced terms of trade effects. That this is indeed the case is revealed by our sensitivity analysis on the export demand elasticity. Doubling the value of this parameter (and therefore halving the terms-of-trade effects) yeilds welfare gains from trade liberalization of over 3%.

Table 5
Results with Increasing Returns to Scale

Sector	Output		Imports (volume)		Exports (volume)		Profits	
	Base level	% change	Base level	% change	Base level	% change	Base level	% change
Food crops	330.5	0.8	2.5	41.1	4.6	-2.6	-	-
Cash crops	131.5	-11.1	8.0	15.8	125.1	-11.3	-	-
Forestry	29.5	8.3	-	-	22.3	4.2	-	-
Food processing	82.9	25.8	18.0	44.4	34.3	59.2	2.4	-28.6
Consumer goods	120.8	-0.9	37.1	47.7	8.2	2.2	11.0	-13.2
Intermediate goods	329.3	21.0	138.6	16.4	146.3	36.7	2.7	-0.5
Cement/ base metals	39.1	109.1	49.6	27.3	15.5	257.2	1.4	22.9
Capital goods	13.4	-0.9	134.7	5.1	6.9	2.1	1.1	-24.2
Construction	174.1	1.6	-	-	-	-	17.5	-15.9
Private services	615.8	-0.4	74.4	2.9	74.4	-2.8	-	-
Public services	164.0	0.0	-	-	-	-	-	-

Sector	Percentage changes				
	Consumer prices	Producer prices	Prices of VA	Marginal costs	Change in s
Food Crops	2.3	2.5	2.6	2.54	-
Cash Crops	-9.1	0.8	0.0	0.8	-
Forestry	39.7	10.1	13.5	10.1	-
Food processing	-9.7	-6.3	-14.4	-2.0	-0.4
Consumer goods	-8.1	-0.3	5.3	-0.1	0.01
Intermediate goods	-7.8	-3.9	-6.1	-1.6	-0.03
Cement/base metals	-16.3	-15.9	-24.7	-6.2	-0.12
Capital goods	-20.2	-1.4	6.0	-0.1	0.02
Construction	-4.3	-4.3	4.2	-4.3	0.02
Private services	6.5	6.5	7.1	6.2	-
Public services	5.4	5.4	7.2	5.2	-

Increase in welfare (%): 2.0

3.3 Increasing returns to scale with free entry and exit of firms

We now turn to the consequences of allowing the number of firms in each imperfectly competitive sector to adjust freely in response to changes in profitability. The appropriate way to view this scenario is not necessarily as a long-run outcome. After all, we allow full labor and capital mobility in the previous experiments. Instead, we can think of this scenario as hypothetical, with no rigidities in industrial structure. In line with accepted terminology, however, we will refer to this as the "long-run" scenario. This scenario is usually constructed by fixing the level of excess profits in each industry to zero, and letting the number of firms adjust endogenously. In our case, the results of such an experiment would not be directly comparable with our base values because our base calibration allows for excess profits; we would be comparing a long-run equilibrium under free trade with a short-run equilibrium under trade protection.

There are two ways in which we can surmount this conceptual difficulty. First, we can establish a new benchmark by solving for an equilibrium in which the existing levels of trade protection are kept fixed, but the number of firms is left free to vary under the zero-profit constraint. We can then compare a zero-profit, free-trade outcome with this benchmark. Second, we can assume that the "observed" pattern of excess profits initially represents a long-run solution. Under this scenario, our free entry experiments would fix the level of firm profits not to zero but to the initial level of profits. Table 6 presents the results of liberalization experiments under both sets of assumptions. It turns out that the consequences of free entry and exit in the two scenarios are virtually indistinguishable from each other.

Table 6
Results with Increasing Returns to Scale and Free Entry and Exit

(a)Excess Profits Fixed at Zero

Sector	Output		Imports (volume)		Exports (volume)		Number of firms	
	Base level	% change	Base level	% change	Base level	% change	Base level	% change
Food crops	330.5	1.0	2.5	41.9	4.6	-2.7	-	-
Cash crops	131.5	-10.9	8.0	15.9	125.1	-11.1	-	-
Forestry	29.5	8.5	-	-	22.3	4.4	-	-
Food processing	89.9	23.6	18.0	45.3	34.3	74.8	3	-2.1
Consumer goods	120.8	-1.7	37.1	48.5	8.2	-16.3	3	-2.8
Intermediate goods	329.3	20.9	138.6	16.5	146.3	33.0	4	0.1
Cement/base metals	39.1	105.7	49.6	26.0	14.6	216.3	4	1.1
Capital goods	13.4	-0.7	134.7	5.2	6.9	-32.5	5	-4.5
Construction	174.1	1.5	-	-	-	-	4	-3.1
Private services	615.8	-0.2	74.4	3.0	74.4	-2.6	-	-
Public services	164.0	0.1	-	-	-	-	-	-

Sector	Percentage changes				
	Consumer prices	Producer prices	Prices of VA	Marginal costs	Change in s
Food Crops	2.5	2.7	2.8	2.7	-
Cash Crops	-9.1	-1.1	0.0	-1.1	-
Forestry	38.5	8.6	13.2	8.6	-
Food processing	-8.8	-5.0	-15.0	-2.0	-0.04
Consumer goods	-7.3	0.7	3.6	-0.1	0.01
Intermediate goods	-7.8	-3.9	-6.7	-1.5	-0.03
Cement/base metals	-16.5	-15.4	-25.5	-6.2	-0.13
Capital goods	-20.2	0.1	3.8	-0.3	0.01
Construction	-3.4	-3.4	1.9	-4.3	0.01
Private services	6.5	6.4	7.1	6.4	-
Public services	5.1	5.1	6.7	5.1	-

Increase in welfare (%): 2.2

Table 6
Results with Increasing Returns to Scale and Free Entry and Exit

(b)Excess Profits Fixed at Initial Level

Sector	Output		Imports (volume)		Exports (volume)		Number of firms	
	Base level	% change	Base level	% change	Base level	% change	Base level	% change
Food crops	330.5	0.9	2.5	41.3	4.6	-2.5	-	-
Cash crops	131.5	-10.9	8.0	15.5	125.1	-11.1	-	-
Forestry	29.5	8.5	-	-	22.3	4.3	-	-
Food processing	82.9	23.3	18.0	45.0	34.3	54.6	3	-2.1
Consumer goods	120.8	-2.0	37.1	48.4	8.2	1.1	3	-2.6
Intermediate goods	329.3	21.2	138.6	16.8	146.3	36.7	4	0.3
Cement/base metals	39.1	117.2	49.6	27.5	15.5	275.6	4	2.4
Capital goods	13.4	0.4	134.7	5.3	6.9	5.5	5	-4.2
Construction	174.1	1.4	-	-	-	-	4	-2.9
Private services	615.8	-0.2	74.4	3.0	74.4	-2.7	-	-
Public services	164.0	0.1	-	-	-	-	-	-

Sector	Percentage changes				
	Consumer prices	Producer prices	Prices of VA	Marginal costs	Change in s
Food Crops	2.3	2.4	2.6	2.4	-
Cash Crops	-9.2	0.7	-0.1	0.7	-
Forestry	39.5	10.0	13.4	10.0	-
Food processing	-8.9	-5.5	-14.7	-2.2	-0.04
Consumer goods	-7.3	0.8	4.0	-0.1	0.01
Intermediate goods	-7.8	-3.9	-6.4	-1.5	-0.03
Cement/base metals	-16.7	-16.8	-25.4	-6.3	-0.12
Capital goods	-20.1	-0.1	4.0	-0.3	0.00
Construction	-3.3	-3.3	2.5	-4.4	0.01
Private services	6.5	6.5	7.2	6.5	-
Public services	5.2	5.2	6.9	5.2	-

Increase in welfare (%): 2.2

Notice first that the number of firms declines in all the four sectors that had been subject to a profit squeeze in the earlier experiment. The exit rate, however, is not spectacular: on the order of 2 to 4.5%. This is comparable to observed entry and exit rates in developing countries, albeit in the absence of policy shocks; for example, Tybout (1989) and Roberts (1988) find that net exit rates average around -3 and 6% per year in three-digit industries in Chile and Colombia, respectively. The *entry* rates in the remaining two sectors are even smaller at around 1 to 2%.[14] These results suggest that in the present model firm-level profits are highly sensitive to changes in competitive pressure caused by entry and exit of firms.

As entry and exit turns out to be limited, we cannot expect great differences in resource allocation and welfare effects from the earlier experiment. Indeed, the pattern of sectoral output remains virtually unchanged, and the overall welfare effect of liberalization is only slightly higher at 2.2%. We notice from the changes in s that, relative to the earlier experiment, firm mobility has, on the whole, desirable consequences for scale. But the effects are not large. Hence, our results provide little evidence of drastic industry rationalization of the sort discovered by Harris (1984) and Gunasekera and Tyers (1989).

3.4 Income distribution

Another area where we would expect imperfect competition to make a difference is income distribution. The present model has fifteen income groups: nine primary factors (capital, three categories of labor, and five sector-specific factors in the competitive sectors) and six groups of oligopolists in the imperfectly competitive industries. Table 7 displays the changes in rate of remuneration of these groups after trade liberalization, in the absence of entry and exit. Note that these are changes in nominal (i.e., undeflated) incomes. But since we have assumed that all consumers have identical and homothetic preferences, these numbers can be used to ascertain how various income groups fare *relative* to each other. The nominal incomes can be converted to real terms by using the change in the consumer price index, reported at the bottom of Table 7.

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[14] The somewhat higher observed entry/exit rates must also reflect the presence of marginal firms, which is ruled out in our symmetric setup.

Table 7
Distributional Consequence of Trade Liberalization*

Primary factors	Percent changes in renumeration from base level	Oligopoly profits	Percent changes in renumeration from base level
Capital	24.4	Food processing	-28.6
Labor:		Consumer goods	-13.2
Rural	1.2	Intermediate goods	-0.5
Urban, unskilled	4.3	Cement/base metals	22.9
Urban, skilled	6.8	Capital goods	-24.2
Specific factors:		Construction	-15.9
Food crops	-0.8		
Cash crops	-24.0		
Forestry	14.6		
Private services	5.6		
Public services	1.2		

Aggregate Consumer Price Index = -0.3

*The trade liberalization experiment in question is the one with IRS (s=1.25) and no entry and exit.

All three labor categories are gainers, as is capital. The biggest losers are the specific factor in cash crops and the oligopolists in four of the six imperfectly competitive sectors. One of the other two sets of oligopolists is the biggest gainer, along with the capitalists. It is evident that the introduction of oligopolistic rents into the analysis renders distributional consequences much more complex. It becomes possible for all primary factors of production to gain from liberalization, at the expense of oligopoly rents. In our analysis, only two out of nine primary factors turn out to be losers, but both of these are in agriculture (fo[illegible]l cash crops). That the distributional consequences [illegible]alization can be adverse to agricultural groups is once ag[illegible]n conflict with conventional wisdom.

4. Conclusion

Given the myriad assumptions we have made to calibrate and run our model, it would be foolhardy to draw direct policy conclusions from the above for Cameroon, let alone for developing countries in general. For all we know, there may be no unexploited scale economies in an economy like Cameroon's. But

our exercise nonetheless provides some interesting conclusions about what might be expected from a more open trade regime in an imperfectly competitive developing economy.

In particular, our results suggest that pro-competitive forces operating on oligopolistic firms will play an important role in countries undergoing trade liberalization. Such forces affect the resource pulls in the economy, thereby influencing the magnitude of the efficiency gains from liberalization. Even when the desirability of liberalization remains unaffected, these differences in resource pulls are interesting in their own right. As our results show, intuition based on perfect competition and traditional tenets of comparative advantage can prove very misleading with respect to the likely consequences of liberalization. Unlike in the perfectly competitive version of our model, liberalization draws resources away from cash crops and into manufacturing. Agricultural landlords are among the biggest losers.[15] To developing country policymakers with a penchant for industrialization, then, trade liberalization should look a lot more appealing in the presence of imperfect competition - provided, that is, they can withstand the political consequences of the loss of oligopoly rents in manufacturing.

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[15] Once again, the reader is reminded that we do not claim our results on the pro-competitive effects of liberalization to be general. More experimentation with alternative demand systems would help expand and sharpen our intuition regarding possible outcomes under imperfect competition.

Appendix

Equations of the Model

(1) $$P_i^M = pw_i^M(1+t_i^M)ER$$

(2) $$P_i^E = PW_i^E ER$$

(3) $$P_i = \left(P_i^D D_i + P_i^M M_i\right)/Q_i$$

(4) $$P_i^V = P_i^D(1-t_i^x) - \sum_j P_j a_{ji}$$

(5) $$P_i^K = \sum_j P_j b_{ji}$$

(6) $$X_i = a_i^D \prod L_{fi}^{\alpha_{fi}}$$

(7) $$W_f WDIST_{fi} = P_i^V \alpha_{fi} X_i / L_{fi}$$

(8) $$INT_i = \sum_j a_{ij} X_j$$

(9) $$E_i = econst\left(PW_i^E / PWSE_i\right)^{-\rho_i^E}$$

(10) $$Q_i = a_i\left[\delta_i M_i^{-\rho_i^c} + (1-\delta_i) D_i^{-\rho_i^c}\right]^{-1/\rho_i^c}$$

(11) $$M_i = D_i\left[\left(P_i^D/P_i^M\right)\left(\delta_i/(1-\delta_i)\right)\right]^{-1/(1+\rho_i^c)}$$

(12) $$Y_f^F = \sum_i W_f WDIST_{fi} L_{fi}$$

(13) $$Y^H = \sum_f Y_f^F - DEPRECIA - TRANSFER + \sum_i PROFITS_i$$

$$\text{TARIFF} = \sum_i t_i^M pw_i^M M_i ER \tag{14}$$

$$\text{INDTAX} = \sum_i t_i^X P_i^X X_i \tag{15}$$

$$\text{DEPRECIA} = \sum_i depr_f P_i L_{if} \tag{16}$$

$$\text{HHSAV} = \text{MPS} \cdot Y^H \tag{17}$$

$$\text{GR} = \text{TARIFF} + \text{INDTAX} + \text{TRANSFER} \tag{18}$$

$$\text{GOVSAV} = \text{GR} - \sum_i P_i G_i \tag{19}$$

$$\text{SAVINGS} = \text{HHSAV} + \text{GOVSAV} + \text{DEPRECIA} + \text{FSAV} \cdot \text{ER} \tag{20}$$

$$P_i C_i = \beta_i^G (1 - \text{MPS}) Y^H \tag{21}$$

$$G_i = \beta_i^G \text{GDTOT} \tag{22}$$

$$DST_i = dstr_i X_i \tag{23}$$

$$\text{FXDINV} = \text{INVEST} - \sum_i P_i DST_i \tag{24}$$

$$P_i^K DK_i = kshr_i X_i \tag{25}$$

$$ID_i = \sum_j b_{ij} DK_j \tag{26}$$

$$X_i = INT_i + C_i + G_i + ID_i + DST_i \tag{27}$$

$$\sum_i L_{if} = \lambda_f \tag{28}$$

$$\sum_i pw_i^M M_i = \sum_i PW_i^E E_i + \text{FSAV} \tag{29}$$

(30) SAVINGS = INVEST

Oligopolistic sectors only

(31) $MC_i = f(W_1, \ldots, W_m, r, P_1, \ldots, P_N)$

(32) $$\frac{P_i^D(1 - t_i^X) - MC_i}{P_i^D(1 - t_i^X)} = -1/N_i\varepsilon_i$$

(33) $$\frac{P_i^E(1 - t_i^X) - MC_i}{P_i^E(1 - t_i^X)} = -1/N_i\eta_i$$

(34) $AC_i = s_i MC_i$

(35) $X_i = g_i(L_1, \ldots, L_m, s_i)$

(36) $PROFITS_i = \{[p_i^D(X_i - E_i) + P_i^E E_i](1 - t_i^x) - AC_i\}X_i$

Definition of variables

P_i^M = domestic price of imports in sector i

pw_i^M = world price of imports in sector i

t_i^M = tariff rate on imports in sector i

ER = nominal exchange rate

P_i^E = domestic price of exports in sector i

PW_i^E = world price of exports in sector i

P_i = price of composite good in sector i

P_i^D = price of domestic good in sector i

D_i = domestic consumption of domestic good i

M_i = imports of sector i

Q_i = consumption of composite good i

P_i^V = price of value added in sector i

t_i^x = indirect tax in sector i

a_{ji} = input-output coefficient

P_i^K = price of a unit of capital in sector i

b_j = capital coefficient

X_i = gross output of sector i

a_i^D = technology parameter in production function of sector i

L_{fi} = demand for factor f by sector i

W_f = wage of factor f

$WDIST_{fi}$ = ratio of wage paid to factor f in sector i to average wage earned by factor f

INT_i = intermediate demand for good i

E_i = exports of sector i

$PWSE_i$ = average world price of exports competing with sector i exports

Y_f^F = factor income of factor f

Y^H = household income

DEPRECIA = depreciation

TRANSFER = transfer payments

TARIFF = tariff revenue

INDTAX = indirect tax on revenue

HHSAV = household savings

MPS = marginal propensity to save

GR = government revenue

GOVSAV = government savings

G_i = government demand for good i

SAVINGS = total savings

FSAV = foreign savings

C_i = consumer demand for good i

GDTOT = total real government expenditure

DST_i = change in stocks

FXDINV = total fixed investment

DK_i = fixed investment by sector i

ID_i = investment demand for sector i's output

λ_f = supply of factor f

MC_i = marginal cost per firm in oligopolistic sector i

r = rate of return to capital

s_i = returns to scale parameter in sector i

N_i = number of firms in sector i

ε_i = elasticity of demand for domestic goods in sector i

η_i = elasticity of demand for exports in sector i

AC_i = average costs per firm in sector i

$PROFITS_i$ = excess profits in sector i

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International Capital Mobility and Tax Avoidance

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1. Introduction

International capital mobility is the main determinant of the effects of capital-income taxation in an open economy. In the presence of international capital mobility a country's savings can *ex-post* differ from a country's investment. Therefore, taxes on assets' income, once portfolios have optimally adjusted, have radically different effects on savings. This paper studies the welfare effects of two forms of taxation of capital income in a small open economy characterized by perfect capital mobility. The first regime is one where all domestic investment income is taxed, but foreign investment income is not taxed. This regime is labeled "source-based taxation." The second regime is one where domestic residents are taxed on all their investment income, domestic and foreign, at the same rate: the regime is labeled "residence-based taxation."

The comparison of these two regimes is relevant because they are the two polar cases in the spectrum of international tax systems actually in place. Even though the theoretical models considered here represent extreme cases that are not observed in practice, these stripped-down economies are a necessary step to identify clearly the types of extensions and applications that are

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more useful to policy formulations (see Section 5 for a discussion).

This paper is motivated both by the observation that tax incentives are an important determinant of international capital flows, and by the evidence suggesting that the response of capital flows to these incentives is large and significant. In many countries international investments can effectively be resorted to for the purpose of avoiding, or evading, domestic taxes. The purchase of foreign assets makes it easy to avoid taxes for three reasons: (a) ownership of foreign assets by domestic residents cannot always be verified and tracked by tax authorities;[1] (b) some governments (like the US government currently) do not levy withholding taxes on income from domestic securities accruing to foreign residents; (c) it is often possible to defer the repayment of taxes on foreign assets' income by deferring the repatriation of such income.[2]

As for the response of capital flows to tax incentives, the evidence is widespread, and growing.[3] This evidence is adding,

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[1] Bank-secrecy laws are the typical example of a hurdle against release of information to foreign tax authorities.

[2] In addition, the complexity of national tax codes, and the differences of tax codes from country to country can blur the distinction between (illegal) tax evasion, and (legal) tax avoidance, and multiply the opportunities of the private sector to minimize tax payments through international transactions. See OECD (1987) for several examples of transactions that are considered legal by some countries, and illegal by others. In my analysis, the distinction between tax avoidance and tax evasion is inconsequential.

[3] For surveys see Kopits (1976), Brean (1984), and Alworth (1988). See also Hartman (1984) on tax determinants of US direct investment, and the more recent work of Papke (1988) on withholding taxes and US corporate borrowing from abroad, and Hines and Hubbard (1989) on the use of deferral by US multinationals.

A recent study by the OECD (1987) reports that in 1978 gross dividend, interest, and other income payments to tax haven residents from sources in the United States represented 42% of all such payments to non-residents. (Tax "havens" are Panama, Hong Kong, Liberia, Bahamas, Netherlands Antilles, Cayman Islands, and Bermuda.) Similarly, in the period 1978-1983, Japanese direct investment to tax havens was on average 18% of total foreign direct investment of that country, reaching, in 1983, 27% of the aggregate.

Dornbusch (1987) argues that the repeal of withholding taxes on US government securities might have been an important determinant of capital flight from Latin American countries.

and providing new insights, to the already large empirical literature on international capital mobility.[4]

International capital flows to evade domestic wealth and capital-income taxes are likely to be a widespread phenomenon among developing countries also (see, for example, Walter, 1986). Tanzi (1983), reviewing the structure of tax revenues in developing countries, notes that (a) income tax revenue is accounted for almost exclusively by taxation of wages; (b) in poor countries the revenue from corporate income taxes is very low; and (c) wealth taxes account for an almost insignificant fraction of total tax revenue. These faces are in principle consistent with the view that international capital mobility imposes severe constraints on fiscal authorities.

Since Feldstein (1980) and Feldstein and Horioka (1983) have pointed to the implications of savings and investment behavior in different countries on international capital movements, a number of dynamic models of international capital flows have been applied to study the effects of distortionary taxes in open economies. Recent contributions include Aizenman (1985), Gordon and Varian (1986), Gordon (1986), Frenkel and Razin (1987), Sinn (1987, especially chapters 7 and 8) Stockman and Hernandez (1988), and Bovenberg (1988). Slemrod (1988) surveys the effects of capital income taxation in open economies, using models that are quite similar to the one adopted in this paper. He notes the standard static models of capital income taxes consistently neglect the distortions affecting intertemporal terms of trade, an effect I concentrate on here. None of these authors, however, provides a formal analysis of the welfare properties of the two alternative forms of capital income taxation mentioned above, along the line followed, for example, by Feldstein (1978) in the closed economy case.[5] In the tradition of the optimal tax literature, I offer such an analysis assuming that the government does not have free access to all possible sources of revenue.

Giovannini (1988), discussing the interwar experience in Italy, indicates that international capital flows to evade wealth taxes were possibly very large, and capital controls were imposed to facilitate extraordinary taxation.

[4] For a survey on international capital mobility, see Obstfeld (1986).

[5] See, however, Hartman (1985) for a welfare analysis of alternative tax regimes in an open economy. Hartman does not concentrate, as this paper does, on source-based versus residence-based taxes. Razin and Sadka (1988) in their own analysis of savings and investment taxes reproduce the production efficiency result, which I discuss below.

Section 2 of this paper presents a two-period model of savings, investment, and the current account, which is applied to study the effects of the two tax regimes. The welfare comparison of source-based and residence-based taxes is carried out in Section 3. Section 4 endogenizes government spending, showing the open-economy effects of dynamic inconsistency and "discretionary" equilibria first discussed by Fischer (1980) and Kydland and Prescott (1980) in closed-economy models. Section 5 contains some concluding remarks, and a discussion of the promising extensions of this line of research. Appendix A shows how the results on optimal taxation and production efficiency apply to the model discussed in this paper. Appendix B proves that a combination of source-based taxes and quantitative controls on international capital flows can achieve an allocation of resources identical to that under a regime of residence-based taxation.

2. The Model

I consider the standard one-good, two-period Fisherian model of an open economy,[6] with no uncertainty. The country is small, in that its own savings and investment do not affect the world rate of interest. This case is both a useful theoretical benchmark, since it helps to highlight all the basic effects that are at work also in a world where countries are "large," and a reasonable empirical paradigm, since very few countries in the world economy are large enough to affect aggregate variables.[7]

There are three agents in the economy: a representative firm, a representative consumer-investor, and the government. The "representative agent" paradigm is consistent with the presence of a large number of price-taker identical agents in each class.[8] The firm has a decreasing-returns-to-scale technology to

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[6] Recent application of the intertemporal current account model include Razin (1984) and Gardner and Kimbrough (1987). See also Obstfeld (1988) for a discussion of the problems analyzed in this paper. Bhagwati (1978) stresses the importance of the effects of taxation and exchange controls on savings for welfare analysis.

[7] International trade theorists will undoubtedly notice the similarity of the analysis in this paper with the analysis of the effects of consumption taxes and production subsidies in the standard international trade model.

[8] The assumption that agents are identical constitutes a potentially serious limitation in a number of applications of dynamic models, but does not seem to represent a hindrance for the analysis that follows.

produce period-two goods with period-one goods. It borrows from the consumer K_2 at the rate R and invests in the production technology to get $f(K_2)$ the second period. It maximizes pure profits, which are $Y = f(K_2) - K_2R$, and pays them, lump sum, to the domestic resident. The optimal investment decision is determined by solving the first-order condition:

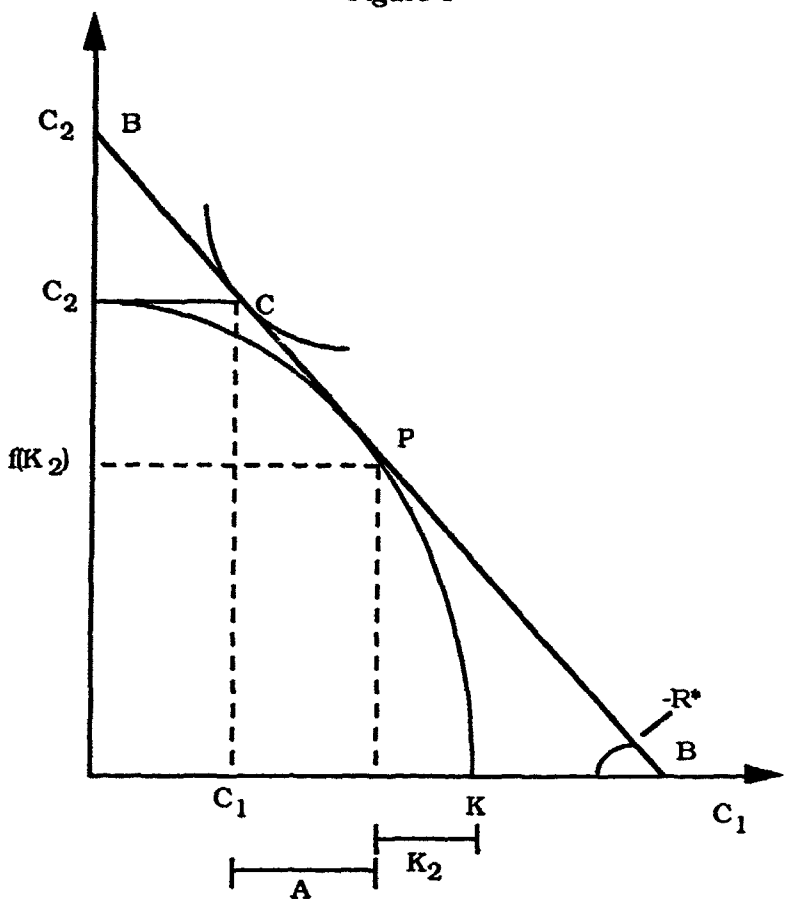
$$f'(K_2) = R \tag{2.1}$$

Notice that, since there are only two periods, there is no capital stock in the second period. The use of all the capital stock in the first period in the production process does not, however, imply that the rate of depreciation is 100%. The concept of depreciation is itself meaningless: since in the second period productive capital does not exist, there is no need to "replace what is worn out."

The consumer-investor starts with an initial endowment K which she allocates between consumption C_1 and savings. Contrary to the firm, however, she has access to the world capital market, where she can borrow or lend at a fixed rate R^*. Portfolio allocation is determined by market equilibrium. The firm borrows the profit-maximizing level of productive investment, and given total savings, international borrowing or lending (denoted by a positive or negative quantity A) is the residual. This result is due to the absence of uncertainty, which makes the consumer indifferent to any changes in the shares of the two assets in her portfolio. In the second period, the consumer receives income from the domestic investment, RK_2, the lump-sum transfer of pure profits Y, and income from foreign investments, R^*A, and is taxed by the government according to the rules specified below. Notice that here, too, the distinction between gross and net interest income and principal repayment is meaningless, because in the second period investment, capital is worthless. Thus, R and R^* represent in this model income from foreign and domestic investments.

Figure 1 shows the determination of equilibrium with no taxes. The bowed-out production-possibility frontier characterizes the domestic technology. Maximum consumption at time 1 equals the stock of available resources, K, plus the present discounted value (at the world rate of interest) of future investment income. In the absence of arbitrage opportunities, $R=R^*$, Hence, the investment level by the domestic firm is determined by the equality of the marginal return on domestic and on foreign investment, i.e., the tangency of the production possibility frontier with the world intertemporal terms of trade -- the BB line with slope $-R^*$. Savings, the current account, and consumption in the two periods are determined by the tangency of the consumption indifference curve and the BB line.

Figure 1



The remaining agent in the economy, the government, announces its policy (taxes and spending) in the first period. Taxes are levied on the consumer's income from domestic and foreign sources, but not on the firm's income. Under the "source" principle, only income from domestic sources is taxed, while under the "residence" principle income from both domestic and foreign sources is taxes at the same rate. In the second period, the government collects tax revenue and uses it to pay for its expenditure G, which yields utility to private agents. Since I assume that government spending affects utility separably from

consumption, the effects of the two systems of taxation can be studied, without loss of generality, *for any give level of G*.[9]

Before proceeding further, it is useful to underline some of the main features of the model, in order to clarify the issues involved in modeling real-world tax systems. First, in this economy the firm does not pay taxes. In other words, there is perfect integration between corporate and individual taxation. This is clearly not verified in the real world, although the popular *imputation system* is designed to approximate this model. The absence of issues of corporate-personal income tax integration seems to be most appropriate for this paper, whose main objective is to characterize alternative international tax regimes.[10]

The absence of any imposition on corporate income implies, in particular, that pure profits are not taxable at the firm level. As we shall see in the next section, this is a crucial feature of the model. It is tantamount to assuming that the government does not have complete freedom in choosing from the menu of taxes. The assumption is motivated both by the well-known fact that the corporate income tax is generally not a tax on pure profits, and by the appropriateness of considering, along the lines of the optimal tax literature, the important role played by constraints in the choice of taxes.

Finally, the perfect symmetry of the two taxation systems modeled here should be stressed. Under the source principle, when $A > 0$ foreign investment income is not taxed, but if $A < 0$ foreign interest payments are not deductible. By contrast, when the residence principle is applied, foreign interest is added to domestic income both when it is positive and when it is negative (Hence, foreign interest costs are deductible). We are now in a position to turn to the formal description of the two tax regimes.

2.1 Source-based taxes

The consumers' problem is:

$$\max_{C_1, C_2} U(C_1, C_2) + v(G) \tag{2.2}$$

subject to:

---

[9] This analysis is in the rest of this section and in the next section. Section 4 shows the case where the government's behavior is endogenous.

[10] Yet, the analysis of this paper can easily be extended to deal with these questions. For example, one could apply the formulas developed by Alworth (1988) to the equilibrium model used here.

$$K_2 + C_1 + A = K \tag{2.3}$$

$$AR^* + (1-\tau)(K_2 R + Y) = C_2 \tag{2.4}$$

Utility is maximized over consumption, for given R and Y. The solution to the consumption-savings problem gives the sum $A+K_2$, whose breakdown is determined by the firm's investment decision. Equilibrium -- for any given level of G that satisfies the government budget constraint (see below) -- is defined by the following set of equations:

$$f'(K_2) = R$$

$$R = R^*/(1-\tau), \tag{2.5}$$

$$U_1(C_1, C_2) = R^* U_2(C_1, C_2) \tag{2.6}$$

plus, of course, the budget constraints (2.3) minus (2.4), and the definition of profits Y. Equation (2.5) is the no-arbitrage-profits condition, which implies that the net return on savings is always equal to the world interest rate.[11] Equation (2.6) is the standard Euler equation, setting the marginal rate of substitution between present and future consumption equal to the marginal rate of transformation, R^*. Note that since $R > R^*$ the pre-tax marginal productivity of domestic investment exceeds the world rate of interest.

Figure 2 is a graphical illustration of this model. Equalization of the after-tax return on domestic investment with the world interest rate decreases the domestic capital stock and domestic production: the fall in K is caused by tax avoidance, which takes place because domestic residents can substitute home capital with tax-free foreign securities. The production distortion originating from the tax, however, does not affect the marginal rate of substitution between present and future consumption, since the fall in domestic investment ensures that the return on savings is still R^*. The budget line shifts further down and to the left, from B'B' to B"B", since tax revenue is not rebated in a lump sum fashion to consumers, but is used to provide for utility-generating "infrastructures." At the consumption point C', the vertical distance between the lines B'B' and B"B" is equal to tax revenue and government spending. Consumption at time 2 is

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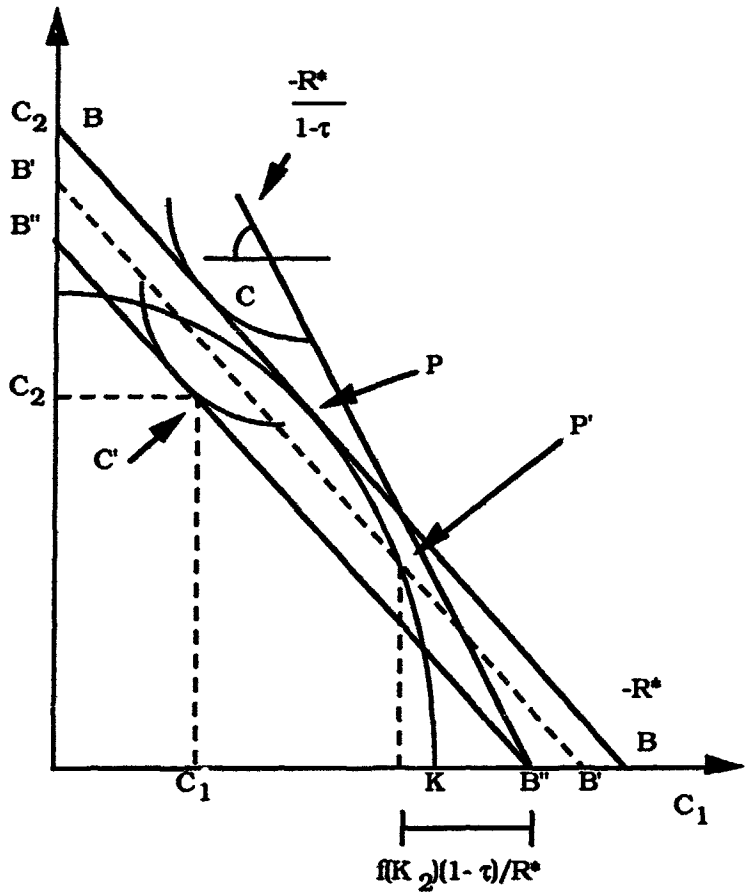
[11] Notice that equation (2.5) would also hold in the case where foreign residents have direct access to the domestic investment technology, but are charged taxes on domestic investment income that equal the taxes paid by domestic residents.

accordingly decreased, for every level of investment. What is the effect of the tax on savings? If present and future consumption are normal goods, an increase in τ increases savings, whereas savings decreases if future consumption is an inferior good. Since the no-arbitrage condition ensures that the rate of return on savings is unchanged, savings is here affected exclusively by the income effect of the tax increase.

Figure 2



2.2 Residence-Based Taxes

When residence-based taxes are levied, income from all assets, domestic and foreign, is taxed at the same rate. The budget constraint, equation (2.4), becomes:

$$[AR^* + K_2R + Y](1-\tau) = C_2 \tag{2.7}$$

The equilibrium conditions are:

$$f'(K_2) = R$$

$$R = R^* \tag{2.8}$$

$$U_1(C_1, C_2) = R^*(1 - \tau)U_2(C_1, C_2) \tag{2.9}$$

plus (2.7) and (2.3).

Figure 3 illustrates the effects of the tax distortions in this case. Investment and the domestic capital stock are now unaffected by changes in τ. Thus, international capital mobility now prevents capital income taxes from distorting the production side of the economy.[12] By contrast, as indicated by (9), the relevant rate of interest for savings is now the *after-tax* world interest rate. The line from B to B" shows the consumption possibilities of domestic residents. At point B, first-period consumption equals the sum of the present discounted value (at world interest rates) of second-period output and the initial endowment K, second-period consumption equals zero, the revenue from taxation of domestic production identically offsets the tax rebates on foreign interest payments, and government spending is zero. the vertical distance between the line from B to B" and the production point P is the revenue from taxation of domestic production. Equilibrium consumption, government spending, and the structure of tax revenues can easily be characterized as indicated in the figure. Line B'B' shows the consumption possibilities of domestic residents before taxation of foreign assets' income. The vertical distance between BB and B'B' is the revenue from the tax on domestic income, while the distance between the line from B to B" and the B'B' line is the revenue (or outlay) from foreign interest income (or payments). What is the response of savings to an increase in taxes? In the absence of international investment for tax avoidance, intertemporal substitutability in consumption tends to decrease savings, while the income effect -- if both periods' consumption levels are normal goods -- increases savings. Thus, the response of savings to an increase in the tax rate is ambiguous, because of conflicting income and substitution effects.

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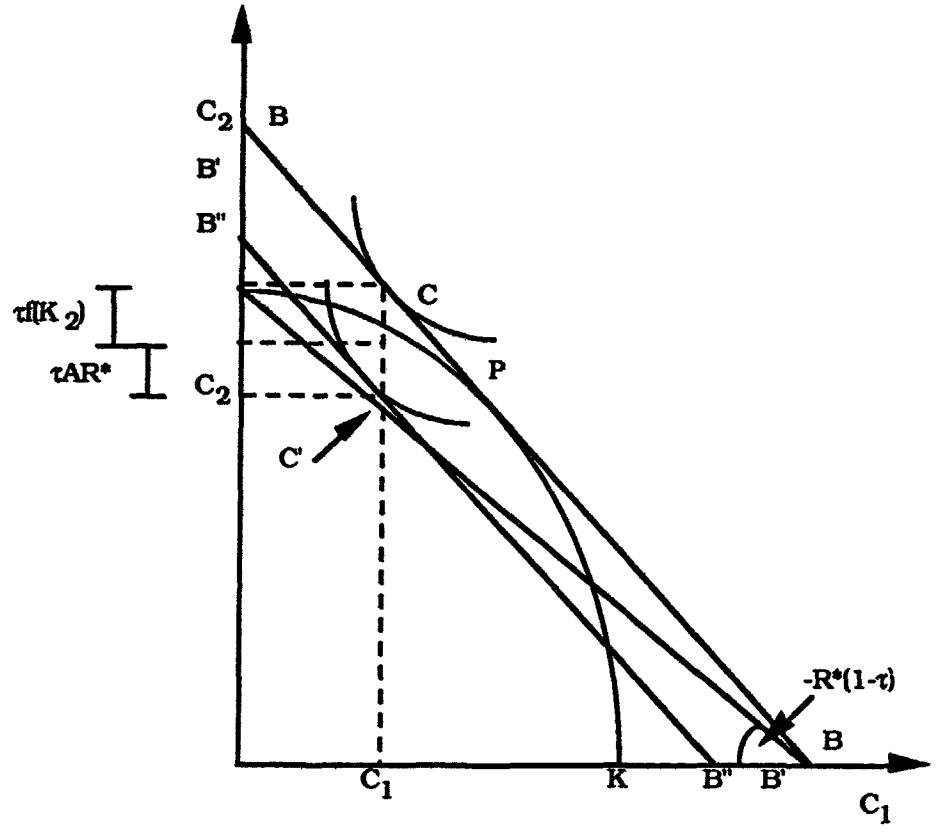
[12] Notice that this would not happen in a closed economy. See, for example, Diamond (1970).

Figure 3



3. Welfare Comparison of the Two Regimes

Since the utility function of the private investors is separable in government spending and consumption, it is useful to analyze an optimal tax problem, where, taking government revenue as given, the menu of residence-based and source-based taxes is chosen so as to minimize welfare losses.[13] By showing the determinants of the optimal combination of savings, taxes, and investment-income taxes to raise a given amount of revenue,

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[13] For surveys of the optimal taxation literature, see Sandmo (1976), Atkinson and Stiglitz (1980), and Auerbach (1985). Horst (1980) and Findlay (1986) use the same techniques to evaluate double taxation of international income flows and the optimal structure of international tax treaties.

we can determine the conditions under which a source-based regime -- where all revenue originates from investment taxes -- is superior to a residence-based regime -- where all revenue originates from savings taxes. Thus, I consider now an optimal tax problem where both source- and residence-based taxes are used.

Substituting the firm's into the private agent's budget constraint, we have:

$$C_1 + \frac{C_2}{(1-\tau_2)R^*} = K + \frac{(1-\tau_1)f(K_2)}{R^*} - K_2 \tag{3.1}$$

The tax rate on income from domestic investment is τ_1, while the savings tax rate is τ_2. In this setup, the firm's first-order condition plus the no-arbitrage condition jointly imply:

$$f'(K_2)(1-\tau_1) = R^* \tag{3.2}$$

Equations (3.1) and (3.2) comprise the two extreme cases studied above. Under a source-based regime, $\tau_2 = 0$ and $\tau_1 \neq 0$. Under a residence-based regime, $\tau_1 = 0$ and $\tau_2 \neq 0$.

The two main features of the optimal tax problem considered here are clearly illustrated in the budget constraint, reported in equation (3.1). First, the second term on the left-hand side shows that the intertemporal terms of trade to consumers are only affected by savings taxation, while the second term on the right-hand side shows that taxation of investment income only introduces production distortions. Second, since the domestic production technology displays decreasing returns to scale, the present value of pure profits are added to the initial resource endowment. This can be verified by noting that, given the no-arbitrage-profits condition,

$$\Pi = \frac{(1-\tau_1)f(K_2)}{R^*} - K_2 = \frac{f(K_2)}{R} - K_2 = \frac{Y}{R} \tag{3.3}$$

where Π denotes the present value of pure profits.

In this problem, the optimal way to raise a given amount of revenue would involve proportional taxation of all goods, first- and second-period consumption, and would give rise to no distortions. Using the budget constraint, we can show that this solution is equivalent to lump-sum taxation of the present value of profits, Π, and first-period endowment, K. Since in our case, first-period consumption, profits, and first-period endowment

are not taxable, taxes necessarily give rise to distortions. Furthermore, because profits are not taxable directly, it might be desirable to deviate from aggregate production efficiency, as an indirect means of taxing profits.

The optimal combination of taxes on domestic investment income (deviation from production efficiency) and taxes on savings, i.e., taxes on second-period consumption, is found by direct application of the formulas in Stiglitz and Dasgupta (1971), and Auerbach (1985) -- whose derivation I outline in Appendix A. These formulas are generalizations of the familiar elasticity formulas that account for the presence of pure profits. Optimal tax formulas can be obtained for a *specific* tax on second-period consumption (the tax on savings) and for the desirable deviation from production efficiency. Let t be the specific tax on second-period consumption. Then the first-order condition for the optimal tax problem yields:

$$St = -\Phi\left(C_2 - \frac{d\Pi}{R^* d(1-\tau_2)}\right) \tag{3.4}$$

$$R^* = f'(K_2) + \Phi\frac{d\Pi}{R^* dA} \tag{3.5}$$

where S is the Hicks-Slutsky substitution between period-one and period-two consumption (a negative number), and the factor Φ measures the marginal excess burden of taxation.[14] Equation (3.4) shows that *other things equal*, the lower the intertemporal substitution in consumption, and the lower the effects of changes in the intertemporal terms of trade on capital accumulation and profits, the larger the optimal level of taxation of savings. Equation (3.5) shows that *other things equal* the more profits can be decreased by increasing foreign investment, the larger the taxation of domestic investment income. Thus, a large deviation from production efficiency would be desirable when, by lowering domestic investment, driving a wedge between domestic and foreign rates of return can lower profits significantly. Given savings, an increase in foreign investment obtained by a corresponding decrease in domestic investment affects profits as follows:

$$\frac{d\Pi}{dK_2} = \frac{d\left(\frac{f(K_2)}{f'(K_2)} - K_2\right)}{dK_2} = \frac{|f''(K_2)|}{[f'(K_2)]^2} \tag{3.6}$$

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[14] Equal to the expression $(\mu-\alpha)/\mu$ in the Appendix.

Notice that the smaller the curvature of the domestic production function, the more similar, or "substitutable" are the domestic and foreign investment technologies, and the less effective is the reallocation of domestic and foreign investments in affecting pure profits.

These observations suggest a general criterion for the welfare comparison of source-based and residence-based taxes.[15] With low intertemporal substitution and high substitutability between domestic and foreign investment, optimal savings taxes are large, while the optimal taxation of domestic investment is low: this is the case where source-based taxation is welfare-inferior. Conversely, optimal savings taxes are low and domestic investment taxes are high when intertemporal substitution in consumption is high, while the substitution between domestic and foreign investment technologies is low. In this case, by correcting the distortions on intertemporal terms of trade that would arise if all savings were taxed, foreign investment for domestic tax avoidance can improve welfare.

Since closed-form solutions to (3.4) and (3.5) cannot be obtained, I perform numerical simulations by assuming the following functional forms for U and f:

$$(3.7) \qquad U(C_1, C_2) = \left[C_1^{1-\theta} + C_2^{1-\theta}/(1-\delta)\right]/(1-\theta)$$

$$(3.8) \qquad f(K_2) = (1/\beta)K_2^{\beta}$$

Under these assumptions, the elasticity of intertemporal substitution and the elasticity of returns to scale are constant, and equal to $1/\delta$ and β, respectively.

The fixed parameters in the simulations are first period GNP K=1, (one plus) the foreign rate of interest $R^*=1.3$, and the utility discount factor $\delta=0.25$. I compute the tax rate required to raise given amounts of revenue, equal to 10, 20, and 30% of first-period GNP. In Table 1, the tax rate is computed both when the source principle is applied (results in the columns labeled (1)) and when the residence principle is applied (results in the columns labeled (2)). I also compute for every level of G -- that is for every level of taxation -- the resulting equilibrium level of domestic production $f(K_2)$ and level of foreign assets A. The last column in Table 1 estimates the welfare ranking of the two regimes. The estimate is the difference between the (equilibrium) value of the utility function when residence-based taxes are used to provide

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15 This criterion, however, cannot be proved analytically since the system of om-linear equations (3.4) minus (3.5) has in general no tractable solution. The validity of this criterion is further verified below, in the numerical simulations.

the given government revenue and the (equilibrium) value of the utility function when source-based taxes are used instead. In order to express this difference in terms of consumption units, I divide it by the value (in equilibrium) of the marginal utility of first-period consumption in the case where the residence based tax is applied.[16] Thus, the welfare loss from source-based taxation is expressed, for every level of tax revenue, as a% of first-period GNP.

The model is solved for different taste and technology parameters. In the top panel, with $\beta = 0.4$, $\theta = 4$ and G = 30% of GNP, international tax avoidance with source-bases taxes makes second-period GDP fall by roughly 10%, and gives rise to a loss (relative to a residence-based tax) equivalent to 1.2% of GNP. The second panel doubles the elasticity of intertemporal substitution in consumption, with a result that the welfare loss of a source-based tax at G=30% of GNP is roughly halved. The two bottom panels in the table show the cases where domestic investment and production are almost unaffected by international investment for tax avoidance, because β is very small. In these cases a source-based tax is welfare-superior to a residence-based tax, especially when the intertemporal substitution elasticity rises to 2 (θ=0.5), as in the bottom panel of the table.

Thus, Table 1 broadly supports the criterion suggested by the optimal taxation formulas: the higher the substitution between domestic and foreign investment and relative to the substitution between present and future consumption, the less desirable is source-based taxation and vice versa.

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[16] The method I follow relies on the simple expression for the normalized change in utility in comparative statics exercises:

$$dU/U_1 = dC_1 + (U_2/U_1)dC_2$$

Table 1
Welfare Comparisons of Source-Based and Residence-Based Taxes with Exogenous Government Spending

G	τ		$f(K_2)$		A		U(2) - U(1)
	(1)	(2)	(1)	(2)	(1)	(2)	
β=0.4 θ=4							
10	.049	.086	203	210	-65	-72	0.0885
20	.102	.165	195	210	-55	-68	0.4293
30	.160	.240	187	210	-45	-65	1.1935
β=0.4 θ=2							
10	.049	.086	203	210	-65	-72	0.0379
20	.102	.168	195	210	-55	-70	0.2129
30	.160	.246	187	210	-44	-67	0.6681
β=0.2 θ=4							
10	.021	.044	466	468	-184	-187	-0.0033
20	.043	.087	463	468	-177	-183	-0.0104
30	0.65	.128	460	468	-171	-180	-0.0162
β=0.2 θ=0.5							
10	.021	.044	466	468	-177	-188	-0.1794
20	.043	.092	463	468	-171	-193	-0.7991
30	.065	.142	460	468	-165	-198	-2.0303

Notes: All variables, except tax rates, are expressed as% of first-period GNP (=K). The columns labeled (1) contain the simulation results for the source-based tax. Columns (2) denote the residence-based tax regime. U(2)-U(1) is the difference between $U(C_1, C_2)$ under residence-based taxes and $U(C_1, C_2)$ under source-based taxes. This difference is also expressed as% of first-period GNP.

The result of this section should be compared with the standard production efficiency result obtained in models where the domestic technology is constant-returns-to-scale. In that case, as is clear from the analysis above, source-based taxes are always inferior.[17] By contrast, I show in this paper that, unless the tax system is sufficiently flexible and efficient (in the sense that the government does not face constraints on the types and extent of use of different taxes), it is in general inappropriate to rule out source-based taxation in an open economy. Hence, this

[17] See Razin and Sadka (1988) for an application of the production efficiency theorem to the problem discussed here.

paper has provided a more general criterion, which admits constraints in government taxing power.

The special case considered here is one where there exist pure profits in production that are not taxable. This case is probably the most relevant, since it is well known that corporate income taxes are quite unlikely to tax pure profits. However, the main argument would also be valid in the presence of another productive factor -- say, labor -- if the amount of tax revenue obtainable from it was subject to a ceiling. Similarly, as Auerbach (1985) shows, this type of criterion would still be valid when profits are taxable, but only up to a fixed limit.[18]

4. The Inconsistency of Optimal Plans: Capital Levies and Capital Flight

This section endogenizes government spending. The government maximizes the representative individual's utility function, taking the optimal responses to taxation as given. As Kydland and Prescott (1980) and Fischer (1980) show, in this type of problem the optimal plans of the government are in general reneged as time goes by, since the ex-ante price elasticity of the demand for capital goods differs from the ex-post elasticity.[19]

What are the government's incentives to impose a capital levy and their effects on investor's behavior? In the analysis that follows, I consider only source-based taxes. The arguments are easily extended to a residence-based tax. The two regimes are explicitly compared in the numerical simulations at the end of this section. Under source-based taxation, the government's problem at time 1 is:

$$\max_{\tau} W(R^*, \Pi + K) + v(G) \tag{4.1}$$

subject to:

$$G = \tau f(K_2) \tag{4.2}$$

$$R^* = f'(K_2)(1-\tau) \tag{4.3}$$

$$\Pi = f(K_2)\frac{(1-\tau)}{R^*} - K_2 \tag{4.4}$$

---

[18] See Phelps (1986) for an analysis of the effects of profits taxation in open economies with capital mobility.

[19] This problem is also discussed by Krugman (1987).

where W represents the indirect utility function. The first-order conditions are:

$$v'(G)\left[1-\frac{f'(K_2)}{f(K_2)}\frac{f'(K_2)}{f''(K_2)}\frac{\tau}{1-\tau}\right]=\frac{W_2}{R^*} \tag{4.5}$$

and equations (4.2), (4.3), and (4.4). The solution of the problem yields a value of τ that investors would use in their portfolio and savings decisions. At time 2 the government might want to renege on the announced tax rate. The problem at time 2 is:

$$\max_{\tau} U(C_1, C_2) + v(G) \tag{4.6}$$

subject to:

$$K_2 + C_1 + A = K \tag{4.7}$$

$$AR^* + f(K_2)(1-\tau) = C_2 \tag{4.8}$$

$$\tau f(K_2) = G \tag{4.9}$$

$$A = \bar{A} \tag{4.10}$$

$$K_2 = \bar{K}_2 \tag{4.11}$$

Since both A and K_2 are given at time 2, C_1 and $f(K_2)$ are also given. Therefore, the first-order conditions are:

$$v'(G) = \frac{\partial U}{\partial C_2} \tag{4.12}$$

and equations (4.7), (4.8), and (4.9).

In the first period the tax base is elastic; hence, the first-order condition that equalizes the marginal (utility) costs and benefits of the tax takes that into account -- as shown by the second term on the right-hand side of (4.5). In the second period, by contrast, the tax base is inelastic; hence, the first-order condition implies that the marginal utility of consumption is equal to the marginal utility of government spending. Are the optimal ex-post taxes higher than ex-ante? The right-hand side of equation (4.5) equals U_1/R^*, since the derivative of the indirect utility function with respect to the present discounted value of available resources equals the Lagrange multiplier associated with the present-value budget constraint, and, in turn, the marginal utility of period-one consumption. Therefore, given the consumption Euler equation (2.6), the right-hand side expressions in equations (4.5) and (4.12) are identical. Thus, a

comparison of the left-hand sides of the two equations shows that ex-post government spending and taxes are always greater than ex-ante, if the marginal utility of government expenditure is decreasing.

Equations (4.5) and (4.12) also reveal that the government's incentive to raise higher taxes ex-post is stronger, when the response of international capital flows to future taxes is larger, i.e., the more "substitutable" the domestic and foreign investment technologies. In this case, the marginal tax revenue term in equation (4.5) is relatively small. Thus, driving a larger wedge between the ex-ante and ex-post marginal utility of government spending.

By a similar argument it is possible to show that, in the uniform taxation case, the government's incentives to raise higher taxes ex-post are postively related to the response of the current account to the savings tax rate: the higher the intertemporal elasticity of substitution, the larger the difference between ex-post and ex-ante taxes.

Historically, examples of extraordinary taxation, like capital levies, debt repudiation, or exhange-rate "maxi" devaluations, are numerous. For this reason, and since the "fooling" equilibrium just described is unlikely to be self-replicating, it is plausible to study equilibria where the public anticipates the government's actions.

Define a *discretionary* equilibrium as one where the public perfectly anticipates future taxes, and the government has no incentives to renege on previous commitments.[20] In the government's problem at time 2, the values of C_1, A, and K_2 -- that the government takes as given -- are functions of taxes expected at time 1. To make sure that the government will have no incentives to change the announced tax rate, the public has to choose A, C_1, and K_2 conditional on a value of τ consistent with the solution of the problem (4.6) minus (4.8) and (4.9) above. Since ex-post taxes are always greater than their ex-ante optimal values, the discretionary equilibrium is characterized by "over-accumulation" of foreign assets.[21] The accumulation of foreign

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[20] See Fischer (1986) for a complete discussion of the welfare ranking of "first best," "time inconsistent," and "discretionary" equilibria.

[21] An interesting historical example of this phenomenon is provided by the Italian experience in 1991. A capital levy was passed by the Italian government in November, and was publicly debated since the beginning of the year. The dollar price of liras in New York fell by 52% from December 1918 to December 1919, and many contemporary observers argued that capital flight for fear of the capital levy reached serious proportions in that year. See Giovannini (1988).

assets in the discretionary equilibrium is larger when the domestic and foreign investment technologies are more similar. Therefore, the arguments for preventing international capital flows in a source-based regime are the same, even when the endogeneity of government spending and the effects of dynamic inconsistency are explicitly accounted for.[22] If the interest elasticity of domestic investment is large relative to the interest elasticity of savings, tax evasion lowers national welfare relative to a regime where domestic and foreign investment income are taxed at the same rate.

Table 2 illustrates these points by reporting simulations of the full time-consistent discretionary equilibrium, assuming $v(G) = G^{1-\theta_1}/(1-\theta_1)$, and $\theta_1 = 1.5$. When $\beta = 0.4$, the public's anticipations of future confiscatory taxes considerably worsens the production distortions associated with a source-based tax: output falls 25% below the first-best optimum of 210. Similarly, when $\beta = 0.2$ and $\theta = 2$, the relative ranking of the two regimes is sharply reversed.[23]

Table 2
Welfare Comparisons of Source-Based and
Residence-Based Taxes
with Endogenous Government Spending

β	θ	τ		$f(K_2)$		A		U(2) - U(1)
		(1)	(2)	(1)	(2)	(1)	(2)	
0.4	4.0	.381	.411	152	210	-9	-55	10
0.2	0.5	.277	.644	432	468	-107	-271	-80

Notes: See Table 1.

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22 Since the logical structure of the proof of this proposition -- as well as its intuition -- are clearly the same as in Section 3, I omit it for brevity's sake.

23 This result stresses the large costs of savings taxation, rather than the superiority of tax evasion, with high intertemporal substitution, and low interest-rate elasticity of domestic investment. Tax evasion is of course still inferior to the regime where both domestic investment income and savings are taxed at differential rates.

5. Conclusion

This paper has analyzed source-based and residence-based taxes in a simple general equilibrium dynamic model, and has discussed the welfare rankings of the two tax regimes. The main result is that the welfare costs of international capital outflows to avoid domestic taxes -- which occur under a source-based tax -- are larger when the interest elasticity of domestic investment, *relative* to the interest elasticity of savings, is larger. Thus, the relative importance of portfolio substitution and intertemporal substitution provide a simple criterion to evaluate the welfare effects of the two regimes, from an individual country's perspective, taking the rest of the world as given. I have argued that the criterion offered here is more generally applicable than the production efficiency criterion -- which suggests that source-based taxes are always inferior -- since in general governments do not have unlimited ability to tax all sources of income. Whenever the taxing power of the government is subject to exogenous constraints (of political or administrative nature) the criterion offered here is the appropriate one to use.

The paper has also shown that the criterion for the welfare-comparison of the two tax regimes is robust to an extension: allowing governments to choose spending and taxes endogenously, and the private sector to guess out the government policies. Numerical simulations suggest that in this case the effects highlighted by the analysis under exogenous tax revenue are magnified.[24] Under a source-based system, the externalities from a non-cooperative tax setting are worse when the substitutability of investments in the different countries, relative to the intertemporal substitution of consumption, is higher. Vice versa, the externalities are small under a residence-based system if intertemporal substitution in consumption is small relative to substitution of international investments.

Section 2 has stressed the simplifying assumptions about the tax structure on which the analysis has relied to highlight the basic effects of the two forms of taxation. This has also produced the additional effect of indicating important extensions of the analysis, which would be aimed at enriching the tax structure and capturing more empirically-relevant tax regimes. In particular, future work could profitably apply the general equilibrium model used here to the study of alternative forms of integration of corporate and individual taxes, of the effects of credits versus

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[24] In Giovannini (1989) I show that the criterion offered in this paper is robust also to an extension of the model to allow non-cooperative interaction among tax authorities.

exemption of foreign taxes, of tax deferral, [25] and of different tax rules depending on the form of ownership of the foreign investment.[26]

In addition, a potentially illuminating extension of this analysis should allow for multi-period investment decisions[27] and for the presence of uncertainty. These and the above-mentioned extensions would lead to a deeper understanding of the production distortions originated by source-based taxes in the presence of international capital mobility, and would ultimately produce strong analytical support for policy design.

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[25] For this, at least a three-period model would be required.

[26] An analysis of the first-order effects of these types of tax rules is offered by Alworth (1988).

[27] Nielsen and Sorensen (1989) provide some results on the neoclassical growth model in an open economy applied to the analysis of alternative tax rules.

Appendix A: Optimal Taxation and Production Efficiency with Decreasing Returns to Scale

In this appendix, I outline the solution of the optimal tax problem, in the presence of a decreasing-returns-to-scale domestic technology, and of an alternative constant-returns-to-scale foreign investment technology. This problem is solved by Auerbach (1985), following the earlier contributions by Stiglitz and Dasgupta (1971), and Diamond and Mirrlees (1971). The government is assumed to choose optimally a specific tax on second-period consumption, by setting the intertemporal terms of trade p (since this model implies a one-to-one relation between p and t), and the allocation of resources to the foreign investment technology A. This latter choice determines the optimal deviation from production efficiency (equality of the marginal productivity of domestic investment to foreign rate of interest).

The problem is formally stated as follows:

$$\max_{p,s} W(p, K + \Pi) \tag{A.1}$$

subject to:

$$h(C + G - s) = 0, \tag{A.2}$$

$$g(s) = 0, \tag{A.3}$$

where:

$$h(z) = -K_2 + f(K_2) = 0 \tag{A.4}$$

$$g(s) = -A + AR^* = 0 \tag{A.5}$$

$$p = q + t \tag{A.6}$$

$$q = dh \tag{A.7}$$

$$zq = \Pi \tag{A.8}$$

q represents the vector of producer prices, normalized taking the price of first period capital to equal 1. Similarly, the price of first-period consumption equals 1. Equations (A.6) and (A.7) indicate that taxes are specific, and that the domestic investment industry is competitive. zq stands for the inner product of the vectors z and q. The vectors C and G represent, respectively, consumption and government revenue: (C_1, C_2), and (0,G). Using (A.1) to (A.5) it is possible to verify the intertemporal budget constraints, equations (2.3) and (2.4) in the text.

This problem implies two first-order conditions:[28]

$$\text{(A.9)} \quad St = -\left(\frac{\mu-\alpha}{\mu}\right)\left(C_2 - \frac{d\Pi}{dp}\right)$$

$$\text{(A.10)} \quad g_2 = h_2 - \left(\frac{\mu-\alpha}{\mu}\right)\frac{d\Pi}{ds_2}$$

Where the subscripts on the g and h function denote their partial derivative with respect to their period-two arguments, S is the substitution between period-one and period-two consumption, μ is the multiplier associated with (A.4) and (A.5), and

$$\alpha = \lambda + \mu\frac{\partial C_2}{\partial(\Pi + K)},$$

where λ is the marginal utility of initial resources, $\Pi + K$. μ-α represents the differences between raising a dollar of revenue at the actual margin and raising it by taking income from the consumer: this latter method induces a secondary loss from the fall in spending and tax revenue.

Equation (A.9) is the standard result from the theory of optimal taxation, corrected for the effect of the tax on profits, through savings and capital accumulation. Equation (A.10) can be rewritten after substituting for h_2 and g_2 -- noting that first-period goods prices are normalized to 1:

$$\text{(A.11)} \quad 1 + r^* = f'(K_2) + \left(\frac{\mu-\alpha}{\mu}\right)\frac{d\Pi}{R^* dA}$$

Appendix B: Quantitative Capital Controls Can Achieve the Uniform Taxation Solution

A residence-based tax like the one described in Section 2 might be difficult to achieve since, for many governments, monitoring international trade in assets and estimating foreign assets' holdings by domestic residents is too costly.[29] Traditionally, outright prohibitions of purchases of foreign assets are a frequently used form of capital controls. Below, I show that appropriately set quantitative controls achieve the

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[28] See Auerbach (1985) for a detailed analysis of these formulas.

[29] Tornell (1987) and Velasco (1987) argue that capital controls might be desirable as second-best devices in the presence of distortionary taxation.

same allocation of resources as a regime of uniform taxation. Consider the following problem:

$$\max_{C_1, C_2} U(C_1, C_2) + v(G) \tag{B.1}$$

subject to:

$$K_2 + C_1 + A = K \tag{B.2}$$

$$AR^* + f(K_2)(1 - \tau) = C_2 \tag{B.3}$$

$$A \leq \bar{A} \tag{B.4}$$

Equation (B.4) represents the quantitive controls on purchases of foreign assets. The first-order conditions for the problem (B.1) minus (B.3) plus (B.4) are:

$$U_1(C_1, C_2) = U_2(C_1, C_2) f'(K_2)(1 - \tau) \tag{B.5}$$

$$U_1(C_1, C_2) = U_2(C_1, C_2)\zeta \tag{B.6}$$

and the intertemporal budget constraint (B.2) minus (B.3), together with the "complementary slackness" condition:

$$\zeta(\bar{A} - A) = 0$$

In this problem, $\bar{A}$ can in fact be set at a level such that distortions on the production side of the economy are avoided. Let $\tau f'(K_2)U_2(C_1,C_2) = \zeta$: from equations (B.5) and (B.6), it follows that $f'(K_2)=R^*$, as implied by equation (2.8) in Section 2.2, and $\zeta = \tau R^* U_2(C_1,C_2)$. Substituting into equation (B.6) yields equation (2.8) of Section 2.2., the other first-order condition from the uniform taxation problem. The full solution produces the values for consumption, savings, and foreign asset accumulation that are obtained in the uniform-taxation problem. Furthermore, given the value of ζ, auctioning the rights to purchase foreign assets generates the same revenue as when foreign assets' income is taxed. Therefore, even when foreign assets' income cannot be taxed, appropriately set quantitative restrictions can achieve an allocation of resources identical to that obtainable with a residence-based tax.

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Contract Farming in Africa: Why, Where, When, and How

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1. Introduction

Contract farming is characterized by a contract between a farmer and a firm that will process and/or market the farmer's crop. It is a growing phenomenon in Africa, and is important for several reasons. It has been a component of some of the most successful income generating projects for smallholder farmers in Africa, and thus deserves examination for its potential for future development. It is being touted as a development strategy consistent with the private sector oriented development strategies so popular recently with major donors. It has also been a component of various schemes involving parastatal processing firms. Moreover, the terms of the contracts between smallholders and parastatals have major consequences for the financial viability of the parastatals, and hence, for the macro balance picture in African economies. Finally, notwithstanding the important successes of contract farming, contracting has also been part of some very unsuccessful schemes, and has been seen as yet another form of exploitation of smallholders by their own governments or the capitalist system. In one way or another, contract farming is at the center of much policy debate in Africa, and the consequences of how that policy debate is resolved are far-reaching.

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This paper reviews the role of contract farming. First, we provide background information on its nature and scope. Second, we discuss ways in which contracting overcomes market failures common in African agriculture. We outline the conditions that make contracting the preferred form of market organization, as well as conditions under which it should not be encouraged. Finally, we discuss alternative types of contracts and the implications for farmers and processors.

Contract farming has been used in some form in most African countries. This paper draws on secondary sources to discuss contracting in Africa generally, and on a recent survey of contracted farmers in Kenya, where the most attention will be focused. This survey was coordinated by Aloys Ayako and funded by the International Development Research Centre of Canada. It covered 118 farmers in three contract schemes. The sample included tobacco farmers in Bungoma district growing under contract to the British American Tobacco Company, farmers growing French beans in Vihiga (in Kakamega district) under contract to Njoro Canners, and farmers growing sweetcorn in Mua Hills, Machakos district, under contract to Kenya Orchards Limited.

2. The Nature and Scope of Contract Farming

2.1 What is contract farming?

Contracting is an intermediate form of industrial organization, standing between spot markets and vertical integration. In spot markets, buyers and sellers meet at the time of purchase. They agree on price, and delivery is immediate. At the other extreme is vertical integration, where the grower of the crop and the user of the crop are within the same firm. In examining the phenomenon of contract farming, we contrast it with those two alternatives.

Contracting is found with many different variants. Contracts are generally entered into at the time a crop is planted. Generally the contract binds a farmer to plant a certain acreage under the crop and deliver the produce from that acreage to the buyer, who promises to buy it. Beyond this outline, contract conditions vary considerably. Sometimes the price is agreed on at the time of contracting, while in other contracts the price is determined later, according to some formula, which may reflect world market prices and costs of the processing firm. It is common for contracting buyers to provide credit for inputs, with the contracted crop serving as collateral for the loan. Sometimes the contracts carry detailed provisions about growing practices, including planting and harvest dates, weeding and fertilizer

practices ,and cultivation techniques. The buyer may also provide extension services to the contracting farmer.

2.2 How much is contracting used?

Contracting is widespread in Africa. One survey of secondary literature found 66 different schemes in sixteen different crops. The number of countries was not mentioned (see Table 1). Note that the contracted crops include both annual and permanent crops, both export and domestic, both food and industrial crops. The processing firms are both private (local and multinational) and parastatal, as well as joint venture.

Table 1A
Typology and Classification of Contract Farming Schemes in Africa Based on Published Sources

Commodity	Class[a]	No.[b] of countries with CF schemes	No. of CF schemes in sample	% of schemes w/ nucleus estate	Ownership % of all schemes		
					Pr	St	P/S[c]
Tobacco	Q	6	6	0	10	45	45
Spices	Q	1	1	0		na	
Coffee	Q	4	4	50	50	50	0
Seed Mlt.	Q	2	2	na	50	50	0
Tea	P/R	5	7	60	33	67	0
Horticultural	P/Q	9	10	10	80	0	20
Dairy	P/T	3	3	25	0	100	0
Cotton	Pr	4	4	50	33	67	0
Palm Oil	Pr	5	8	100	0	80	20
Sugar	P/Pr	6	12	90	33	33	33
Pineapples	Pr	2	2	50	50	0	50
Rubber	Pr	2	2	100	0	50	50
Oilseeds	Pr	1	1	0	100	0	0
Poultry	T	1	1	100	0	0	100
Rice	F	2	2	0	0	0	100
Gari	F/Pr	1	1	0	100	0	0

[a] Q Quality Control
P Perishability
Pr Large-Scale Processing
F Food Contracts

[b] CF Contract Farming

[c] Pr Private
St State
P/S Joint Venture

a recent paper, Deaton (1989) emphasized the role of saving in protecting the living standard of poor people whose income is low and uncertain. Saving, in his opinion, is not only about growth, "it is about smoothing consumption in the face of volatile and unpredictable income." Given the significance of saving in economic development, it is important to investigate the determinants of household saving, its future trend, and the policy implications.

China's domestic saving rate has been among the highest in less developed countries, at about 30% of GDP in the last three decades. Household saving rose and its share in domestic savings increased rapidly during the economic reform. The saving behavior of Chinese households and its trend have therefore received attention, but most of the previous studies on Chinese savings have used aggregate time series data. Many important determinants of saving, such as age, education, occupation, and regional differences, cannot be investigated by time series analysis. A household survey on consumption and savings conducted by the Chinese Academy of Social Sciences (CASS) is now available, which facilitates research on the economic behavior of more than one billion Chinese.[2]

The objective of this research is to investigate the saving and wealth accumulation behavior of Chinese rural and urban households by applying life-cycle/permanent income models. Questions being asked here include first, what are the determinants of permanent income for Chinese households? Can wages and salaries be treated as permanent income, given their stability in China's urban sector? Second, how and to what extent are the household cumulated savings (wealth) affected by household permanent income, transitory income, age, occupation, and other taste shifters? Third, is there a "survival threshold" income below which households are unable to save? Fourth, do Chinese households need to dissave after retirement, given a good pension system in the urban sector and extended families in the rural sector? Finally, from the findings of this research, what can be considered appropriate policies for China's resource mobilization, poverty alleviation, and social security system? These are research questions that have never been investigated. The examination of these questions will help us to understand the household behavior and the trend of savings in a command economy under rapid transition, which may illuminate government policies for China as well as for other socialist economies under transition.

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[2] The survey is jointly being analyzed by the London School of Economics and CASS, under the general direction of Ehtisham Ahmad, Athar Hussain, and Nicholas Stern. I am grateful to them for providing the data set.

2.3 How successful has contract farming been?

The success of contract farming can be measured in several ways. It has permitted the introduction of several lucrative cash crops to smallholders. In some cases these crops can really only be successfully grown by smallholders under a contractual arrangement, while in other cases a contract scheme initially demonstrated the viability of the crop, for which spot markets then developed.

In Kenya the main contracted crops have been tea, sugar, and tobacco. Furthermore, most of the growth in these crops has come from contracted smallholders, all in the case of tobacco, at least three quarters in sugar, and most in the case of tea (at least since the early 1970s). Horticultural crops have also been contracted under various schemes, but the schemes have been unstable. No figures are available on what percentage of horticultural crops are contracted. The share of the value of these contracted crops in the total value of marketed crops increased from 22% in 1964 to between 45-50% in the mid-1980s. The value of horticultural crops rose from 3 million shillings in 1968 to 630 million in 1986.

It is clear that this rapid growth in the contracted crops was associated with increases in grower incomes. One source of verification comes from calculations of gross margins for different crops, as estimated in Table 2.

Table 2
Average Gross Income per Production Season (KSh/acre)

Cash/Food Crops	KSh/acre	Asian Vegetables	KSh/acre
Sugar	18,559	Karela	24,000
Tea	11,227	Chillies	18,000
Coffee	9,418	Okra	16,500
Pyrethrum	3,736	Aubergine	12,000
Maize	1,584		

Source: Jaffee, 1988, p. 88.

Further evidence corroborates the positive effect on grower incomes. In the mid-1970s, comparisons of average incomes of tea farmers with average incomes in their districts showed much higher income per hectare for tea farmers (Buch-Hansen & Marcussen, 1982, p.28). The same held true for sugar farmers. Furthermore, where contract schemes existed most farmers chose to participate. For example, in the Mumias area, only 13% of farmers did not obtain contracts, and some of those tried to. Leaving the schemes was also unusual (Buch-Hansen &

Marcussen, 1982, p. 26). In the Ayako sample (1988) a quarter of the combined sample reported that they would have planted even more of their land under contract if their acreage had not been limited by the scheme. Of 107 responses, 89 felt that there were benefits to joining the scheme, especially those of higher incomes and better timing of cash receipts.

In the more successful schemes agronomic practices are definitely more advanced than for Kenya as a whole. For example, forty-one out of forty-two tobacco farmers used fertilizer, while forty used pesticide. Half of French bean farmers used fertilizer. In tea areas it has been reported that the greater availability of cash as well as the demonstration effect on tea has spilled over so that tea farmers use more fertilizer on their other crops than do their neighbors.

For most contract farmers, the contract crop is the only lucrative cash crop available to them. In the Ayako sample the only other cash crop grown was coffee, grown by 4 of the 118 sample households. Substantial savings were reported by tobacco farmers in the Ayako sample (mean income was reported as Kenyan Shillings (KSh) 11,629 while mean expenditures were reported as KSh 6,515), with smaller and less reliable savings being reported by seed corn farmers and dissaving by French bean farmers.

Some express concern about increased differentiation arising from contract farming. To some extent this is inevitable, because not all farmers participate to the same extent. Nonetheless, there are factors limiting the degree of differentiation. One is that the acreage contracted is often limited to what the scheme administration thinks a family can handle with family labor. This means that the variance in contracted acreage administration is much less than the variance in owned acreage. In fact, in the Ayako sample the two showed a small negative correlation. Buch-Hansen and Marcussen (1982) report that for many small farmers contracting has meant the difference between self-sufficiency and having to sell land. Hence, the introduction of lucrative new crops to smallholders has probably slowed the concentration of landholding and migration to the cities.

3. Why Use Contracting?

In order to understand why contracting is growing in importance, we contrast it to both spot markets and vertical integration. Whatever form of industrial organization is chosen must coordinate the supply of and demand for a commodity. There must be coordination as to the quantity of a crop, various dimensions of quality, where it will be produced, and the timing

of production. The three forms of market organization have differential capabilities to provide all this coordination. Various forms of market imperfection can make one form more desirable or efficient than another.

3.1 Imperfect information

Agricultural produce may vary in many ways: by moisture content, sugar content, size, percentage of broken or damaged units, flavor, color, variety, or timing of delivery. Buyers have preferences over these characteristics and may be willing to pay substantial premia for produce with certain qualities.

Buyers' preferences may not be very efficiently conveyed via spot markets, because there are many dimensions of information and only relatively crude price signals. A farmer may deliver his or her produce to market and discover that it fetches a much lower price than expected. It may be impossible for the farmer to distinguish whether the reason for the low price is due to timing or to one or more of the other qualities mentioned, or due to random shocks to the supply or demand function. The farmer may not know what to do differently next time. It will not take many rounds of disappointing returns for farmers to become discouraged from growing particular crops at which they could succeed if they received more nuanced information than that provided via spot markets. If the crop has a long growing cycle and capital markets are imperfect, the effect will be even more dramatic.

Compounding these problems are classical problems of imperfect or asymmetric information. There are qualities of a crop that are better known to one side of the bargain than to the other. For example, farmers may pack their produce so that the highest quality produce is on the top, available for quick inspection, while damaged or inferior produce is concealed. Or some qualities, like sucrose content, may be measurable only using sophisticated testing techniques. In such cases the farmer is at the mercy of the buyer. When buyer or seller cannot be sure of the quality of the produce except at prohibitive cost, the market will not function efficiently, possibly not at all (Akerlof, 1984). In such a market, long-term relationships that depend on reputation may reduce opportunism and permit efficient resource allocation (Williamson, 1979).

Problems of timing may be especially difficult to convey via spot markets. Demand may be very sensitive to timing. This could be true if crops from tropical or southern hemisphere countries are being marketed in the northern hemisphere to supplement local production during the off-season there. It could also happen when crops are highly perishable in the form in which they are sold at the farmgate, so that coordinating delivery of many farmers' crops to the processing point is important to

avoid heavy losses due to spoilage. In the short-run, both demand and supply are likely to be highly inelastic, so that spot market prices may fluctuate enormously. Whether these wild swings in price are translated into information that helps coordinate supply and demand better in future is dubious. The price volatility is more likely to be perceived by both buyer and seller as excessive riskiness.

An illustration of the failure of spot markets to provide efficient coordination is the production of Asian vegetables in Kenya. There are some twenty to thirty specialty vegetables eaten primarily by south Asians. They are grown in Kenya for export to the United Kingdom, a market that grew rapidly in the 1970s and 1980s (28% per annum, by volume, from 1968-83). The market structure in Kenya is characterized by extreme fragmentation and uncertainty, resulting in substantial waste and missed opportunities. There are some 100 licensed exporters, though 9 firms export some 90% of the total. This small number of larger firms operates at a large enough scale to invest in facilities such as warehouses and cooling facilities. The other firms operate sporadically, buying during periods of high prices for immediate shipment. Asian vegetables are grown by both large and small farmers, mostly in irrigation schemes in Machakos district. In the early 1980s 75-80% of Asian vegetable exports were grown by smallholders.

There is no overall planning or guidance for planting mix. Each exporter tries to purchase a balanced mix of the different products to satisfy orders from their buyers in the United Kingdom. Typically they fail, so that some items are in surplus and others in shortage. Total wastage is extremely high. Some 30-50% of produce is never harvested because it is not in demand at the time. Further, high wastage occurs at the airport in Nairobi, where cargo space is often unavailable at the last minute, and still more wastage in the United Kingdom when surplus items are rejected or regraded. The spot market method of coordination clearly leaves a lot of room for improvement.

3.2 Imperfect capital and land markets

Capital markets in rural areas of developing countries generally develop very late. Formal sector institutions are slow to extend their operations into rural areas because of excessive information costs and unavailability of collateral. Local lenders are inhibited by problems of synchronic timing and covariant risk among borrowers (Binswanger & Rosensweig, 1986). In Africa most land is unregistered, and even where land is registered, the legal system often hesitates to enforce confiscation in the face of default on loans (Migot-Adholla, et al., 1991).

The failure of capital markets clearly inhibits adoption of new crops, which often requires investments in new seeds,

fertilizers, land improvement, or accompanying investments (such as planting trees for firewood to be used to cure tobacco) (Stevens & Jabara, 1988). The inhibiting effect is magnified when the gestation period of new crops exceeds that of traditional crops. For example, whereas food crops like maize and beans can be harvested twice yearly in most arable regions of Kenya, the first payment for a sugarcane crop comes eighteen months after planting, while tea will not yield a significant harvest for several years.

Contracting can be viewed as a form of market interlinkage, overcoming (at least partly) capital market failure (Mitra, 1983). The contracted crop can serve as collateral, even in the absence of title deeds to land or appropriability of land. Contract farming serves this function only if the processing firm can be sure that it will receive the crop from the farmer. The possibility of poaching from other buyers (when farmers renege on their contracts to deliver their produce to spot buyers) undermines the ability of contracting to overcome capital market imperfections (Siamwalla, 1987).

There is empirical evidence to suggest that substantial poaching is important in determining whether contracting can be used to replace otherwise non-existent capital markets. In the Ayako sample, for example, most tobacco and French bean farmers received credit through the scheme (35 out of 42 and 42 out of 46, respectively). These farmers reported overwhelmingly that they are unable to sell their crop to anyone besides the project authority (40 out of 41 and 41 out of 45 for tobacco and French beans, respectively). In contrast, in the Kenya Horticultural Exporters (KHE) scheme for exporting Asian vegetables, "farmers utilized the KHE contract as a sort of safety net...looking for alternative buyers at higher cash prices, but then falling back on the KHE commitment when market circumstances necessitated." Deliveries of aubergine in a 12-month period ranged from 1.3 tons to 25.1 tons, while KHE had contracted for 12 tons per month. KHE, understandably, did not provide credit. (Jaffee, 1988, p. 102) Credit to sunflower growers was discontinued by Oil Crop Development Ltd. (OCD) in response to increased poaching from other millers, which made land recovery impossible (Ayako, et al., 1989, p. 7).

Since land titles become unnecessary to agricultural credit, contracting permits the spread of lucrative crops to farmers who might otherwise be excluded. Women-headed households constitute one such group of farmers. Vihiga, where the French bean survey was done, is an area where much of the adult male population has emigrated. The Njoro scheme successfully introduced a lucrative new crop to women farmers, increasing women's control over family income. Likewise, the tobacco scheme works primarily with women farmers (Ayako, et al., 1989, p. 8).

We are not arguing here that contracting always improves the status of women. Indeed, various schemes have been criticized for having the opposite effect (Watts, et al., 1988, p. 70). However, it can permit access to capital for women who would otherwise be barred, and hence, may make the difference between access to lucrative new crops or no access.

3.3 Vertical integration -- limits to size

Most of the sources of market failure discussed so far suggest that spot markets cannot function well in developing country agriculture. There is, of course, the alternative of vertical integration. Certainly the presence of plantations in the former colonies testifies to its viability as an alternative. Why might contracting sometimes be a desirable alternative to vertical integration? There are several reasons.

One limitation to vertical integration arises if the minimum efficient scale of different stages of operation occurs at drastically differing scales of production. If, for example, the volume of produce that can be handled by one processing factory can be grown most efficiently by a large number of farmers, then vertical integration will be inferior to contracting. For this to be true, there must not simply be a lack of economies of scale in farming, there must be *dis*economies of scale. What could be the cause of such diseconomies? The answer lies in the problem of labor supervision. For some crops, the person performing the labor has to make many detailed decisions, and monitoring these decisions to see if the work has been done properly requires substantial time and cost. Where husbandry techniques are important and difficult to observe, estate agriculture will be less efficient than small-scale owner-cultivator farming. Some crops have higher labor supervision costs than others. For example, cutting sugarcane can be relatively easily monitored. On the other hand, harvesting French beans requires the farmer to judge each day which beans are ready for harvest, with repeated passes through the same field as the crop matures. Monitoring this work would be very expensive.

Contracting may appear desirable to the processor compared with vertical integration on grounds of risk sharing. A vertically integrated producer makes large fixed investments in acquiring and establishing a plantation. Depending on the political climate and the type of investor, these may appear prohibitively risky, e.g., if expropriation is a possibility. Contracting may be a way of limiting investment risk, and the concomitant investment undertaken by other parties may be seen as supplying political leverage to the firm in future dealings with government.

Another type of risk sharing is implied by contracting in contrast with vertical integration. The vertically integrated firm

owns its crop from the time of planting. It thus bears full production risk, as well as price risk. It may prefer to shift these risks to outgrowers. To the extent that labor practices influence production risk, this may be a Pareto-improving change in governance. For example, mulching may aid water retention and diminish the probability of crop failure due to insufficient rain. If farmers bear production risk they will have proper incentives to undertake such labor-intensive risk-reducing practices.

3.4 First mover problems with new crops

Contracting may be a crucial first step, even if there is no need for it to persist in the long run (Williamson, 1983). For example, in the early 1980s East African Industries and parastatals realized that Kenya could economically grow its own oilseeds, rather than importing palm oil from West Africa. The initial investment in milling capacity came from the OCD, a subsidiary of East African Industries, which set up contracts with farmers, originally primarily with largeholders. Contracting was used to break the vicious cycle that had existed previously: farmers did not grow oilseeds because there was no miller to sell them to, but no one had invested in a mill because oilseeds were not grown in Kenya. The scheme expanded, but its very success caused a transformation of the market. Seeing the success of OCD, several other millers entered, competing vigorously for the crop. Furthermore, smallholders displaced largeholders. Currently 70,000 smallholders in marginal areas grow sunflower, which provides high returns relative to other crops, and provides cash in the season during which farmers are buying inputs for the short rains and paying school fees. There is little reason for sunflower to be contracted. It is non-perishable, allowing spot markets to work reasonably well; it has a short growing cycle and its timing fits well with other crops, so that credit is not essential. Nevertheless, contract farming seems to have been an essential component in the process of the very successful introduction of this new crop (Ayako, et al., 1989, p. 7-8).

3.5 Monopsony and backward regions

Much criticism of contract farming has centered around the fact that it creates monopsony power insofar as it ties the farmer to one buyer (Buch-Hansen & Marcussen, 1982; Clapp, 1988). Indeed, contracting functions most smoothly if there are no other buyers, because the contracts are self-enforcing (Telser, 1980).

The desirability of monopsony (from the point of view of the buyer) gives rise to a dividend: processors have an incentive to introduce new crops in new regions, spreading income-earning opportunities into relatively less developed regions. This factor

was important in the choice of Vihiga by Njoro Canners for the French bean scheme (Jaffee, 1988, p. 27).

3.6 Extension

The market for information is imperfect. Those who do not have information are reluctant to buy it, since they cannot tell the value of what they are acquiring. Thus, information on markets and the husbandry techniques that would most profitably satisfy market demand has not flowed freely, especially in a poor country with low literacy and poor communications. One remedy for this market imperfection is public provision of extension. Yet public sector institutions in poor countries are also notoriously weak, so that remedy is partial at best. Contract farming, however, has proven to be an effective conduit for information. Scheme authorities have incentives to provide optimal levels of extension because they reap benefits (Minot, 1986, p. 16). They have an incentive to learn from farmers' experience and modify their advice accordingly. Farmers are more inclined to trust extension advice from someone willing to contract for their crop than from government extension agents who have no stake in their success.

Most contract schemes in Africa have involved much higher ratios of extension agents to farmers than are typically found outside of contract schemes. The exact levels vary, depending on the crop and how new it is to farmers, but reported ratios are typically in the range of 1:50 to 1:200. Ratios outside of contracting, in the same countries, are typically more in the range of 1:1,000 or lower (Watts, et al., 1988, pp. 176-9). Thus contracting has helped overcome a major market imperfection that inhibits income growth.

3.7 Principal-agent problems and organizational failure

In some markets, for reasons sketched above, spot markets may be an inefficient form of organization. Yet operation of a contracting scheme may involve a larger, more complex organization. Asymmetric information may create organizational failure that undermines the ability of a contract scheme to function where it would otherwise be the preferred form of organization. The literature (as well as the popular press) is full of complaints of schemes in which employees cheat farmers by such practices as short-weighing or failure to pay. Sometimes these complaints may reflect official scheme policy and lack of viability of a market, but many times they reflect opportunistic behavior on the part of employees, which is difficult for the scheme to prevent (See Jaffee 1988 for examples).

3.8 Summary

Characteristics of crops influence which market structure (spot market, contracting, vertical integration) will work best. Characteristics that contribute to the success of spot markets include homogeneity, non-perishability, and short growing cycles. Characteristics that contribute to the success of vertical integration include economies of scale and perishability. Contracting will be the best form of organization for those crops for which husbandry techniques are important and perishability requires careful coordination between growing and processing. It is here and only here that contract farming should be encouraged.

4. Important Contract Clauses

In this section we examine three issues regarding the content of contracts that have engendered much debate. These features of contracts have important consequences for both farmers and processors alike.

4.1 Price clauses and risk sharing

As mentioned above, there are two variants of how price is determined. In some contracts price is specified in advance, based on price expectations. Since weather and world market conditions are not known at the time price is specified, the contract price may turn out to be either above or below the spot price at the time of harvest. On other contracts price is calculated later, as a residual after subtracting processors' costs from revenues obtained.

Use of fixed price contracts increases risk for the processing firm. Under formula price contracts the contracting firm cannot make losses; neither can it make large profits. Under fixed price contracts both are possible (see Grosh, 1991). Formula price contracts are more common with public enterprise processing firms, since they do not consider the inability to earn large profits to be as much of a disadvantage as do private firms. Many contract processing firms are parastatals, whose losses have come to be seen as a *sine qua non* of parastatal crop authorities. These losses often constitute a large part of chronic government budget deficits, suggesting that a switch to formula pricing schemes on the part of parastatal firms could improve considerably the macroeconomic balance of many African countries.

There is empirical evidence that fixed pricing increases the riskiness of marketing boards. In a sample of twenty-one

marketing boards, five out of five firms using formula prices reported small to moderate positive average rates of return. In contrast, eleven out of sixteen boards using fixed pricing reported negative average rates of return (Grosh, 1992). Not all the marketing boards used contracts, which ought to stabilize throughput to some extent, so the results are not quite comparable with results for contract schemes only. However, we shall see below that the use of fixed prices compromises enforceability of contracts in ways that make the results more relevant in fact than in theory.

How does the pricing clause affect farmer risk? The answer is ambiguous. Note first that farmers, to the extent that they are risk averse, care about variability in income, not price. If price and quantity were otherwise inversely correlated (if the main source of price variation were supply shifts) then fixing price in advance via contract would in many cases cause the variance in income to increase. If price were otherwise positively correlated with quantity, fixing price would tend to stabilize income (Behrman, 1984). This would occur at the expense of average income levels because farmers would forego costly techniques to increase output in response to higher prices. Such income stabilization may be inferior to consumption smoothing via voluntary saving. Roughly speaking, price variation occurs primarily in response to supply conditions within African countries for local food crops, while price and quantity are positively correlated for export crops (Grosh, 1992).

Use of fixed pricing increases processor risk and hence, scheme viability in another way -- by reducing farmers' incentives to comply with their contracts. If spot prices rise above the contract price, farmers will attempt to renege on their contracts, and in the absence of true monopsony, the contracting scheme may collapse. This is most likely to be a problem with crops for which spot markets are viable, either because the crop does not require processing, and hence, there are low barriers to entry (e.g., the "cowboy" horticulture exporters of Kenya who enter and exit freely) or where the crop is relatively non-perishable, so that it can be transported and stored easily (e.g., oilseeds). During the 1984 drought in Kenya, spot prices of Asian vegetables soared to levels two or three times the contract price. Deliveries to the contracting firm dwindled in favor of spot buyers, and the scheme collapsed. As we saw above, the spot market form of organizing the horticulture market has been highly inefficient because of poor information and lack of investment by spot buyers in storage and marketing overhead equipment. Yet fixed price contracts proved unenforceable in the presence of large fluctuations in spot prices. After the collapse of contracting, KHE began moving toward backward vertical integration into large farms. The failure of both spot markets and contracts is forcing

smallholders out of a lucrative crop, a crop for which they are the most efficient growers.

What form of price clause is preferable? Formula prices will yield consistent rates of return for processors, will encourage farmers to deliver their produce to the firm that has contracted for it, and hence, will contribute to stable throughput. This will permit cost containment and reliable ability on the part of the processing firm to pay for produce (Grosh, 1992). Fixed price contracts enhance the possibility of large positive (as well as negative) profits to processors, but will generally be unenforceable if the processor faces any competition for supplies, rendering the scheme nonviable. Farmers could theoretically benefit from the income stabilization that attends fixed prices in export markets, but at a sacrifice in average income levels.

4.2 Farming practices

Many contracts require that farmers follow farming practices prescribed by the scheme. Practices specified often include land preparation techniques, planting dates, fertilizer application rates and dates, weeding specifications, seed variety, irrigation practices, as well as harvest date and standards. These clauses often cause considerable friction between farmers and scheme authorities (Clapp, 1988).

The various practices specified affect yields, timing, quality, and other characteristics that alter the crops' value to processors. In most cases these characteristics are not reflected in price differentials to farmers. Thus the detailed specification of husbandry practices replaces the detailed specification of price schedules. In some cases transaction costs may make specification of all relevant parameters in pricing structures impossible. For example, the cost of testing each farmer's cane for sucrose content may be prohibitive. In other cases it may be feasible to use a farmgate pricing system that reflects market value. The Coffee Board of Kenya uses ten different grades of coffee and pays farmers in proportion to the world price of each.

The problem with the use of husbandry specifications in place of complex price schedules is that it may thwart economic rationality. This is most obvious in the case of practices affecting the quantity and timing of labor. The schemes bear none of the labor costs, and thus have no reason to consider such costs when specifying practices to be followed. Farmers are acutely aware of the opportunity costs of labor and of the fact that opportunity costs vary by season, according to other demands on their time. If the effect of farming practices is reflected in farmers' returns, they can balance the costs and benefits and use those techniques that equate marginal cost with marginal benefit. If the effect of such practices is not reflected in farmers' returns, there is no reason to believe that such economic rationality will be achieved.

The Kenya Tea Development Authority (KTDA) is one example of a scheme that has responded to farmers' desires by easing its control over farming practices. In its early years the KTDA used rigid rules regarding farming practices, especially regarding fertilizer. Farmers are well represented within the KTDA governance structure, and over the years KTDA has gone from enforcing the practices it considers best to simply encouraging them (Steeves, 1975; Lamb and Muller, 1982). Farmers are able to balance the marginal productivity of fertilizer in tea with that in other crops, while taking into account the timing of resulting increased labor requirements in harvesting, and the opportunity cost thereof.

4.3 Enforceability, monopsony, and spot markets

Contract farming involves a written agreement between farmers and a processing firm. Yet these contracts are not legally enforceable in practice. The transaction costs involved in suing a smallholder are prohibitive, the remedies available unappealing, and the danger of souring relations with other smallholders considerable. So the only real threat that a scheme has against farmers who do not comply with the terms of the contract is discontinuation.

Public officials could assist in the enforcement of contracts. When a particular scheme is experiencing problems with its produce being poached by other buyers, local administration officials could be on the lookout for the other buyers, and question movements of produce in their jurisdiction, just as they enforce the monopoly of state marketing boards. Although they are unlikely to be totally successful, they could be of considerable assistance to a scheme. The question is, is the creation of an enforceable contract, when apparently there is a viable spot market, a desirable goal? We suggest that in theory the creation of enforceable contracts would be desirable for farmers. However, it creates the possibility of substantial abuse.

There are other measures that contribute indirectly to the success of contract farming, which should be employed before throwing the police power of the state behind enforceability of contract farming. Many problems that undermine enforceability can be dealt with more directly. For example, there are reports of farmers being cheated by buying agents. Extension of the banking system to rural areas permits better paper trails that help to control abuse by scheme employees. Organizations of outgrowers may also help control abuses by scheme employees. Information on spot prices that originates with the scheme may not be credible because the scheme has an incentive to misrepresent market conditions. Government provision of market information may diminish the asymmetry problems that undermine market

viability. Contracts that make use of a formula based price instead of a fixed price ought to be less liable to poaching.

The extent to which public agencies should support enforcement of contracts depends on an assessment of how important contracting is in a particular commodity. We saw above that contracting collapsed in oilseeds. In that commodity the underlying conditions did not make spot markets inefficient the way we have seen them to be in horticulture, largely because of differences in perishability and hence, volatility. Where spot markets can function effectively, there is little reason to encourage contracting and its potential for monopsonistic abuse. Contracting should only be encouraged for a limited range of crops. Where poaching consistently undermines it, we must question how farmers benefit from its use as a form of market organization.

5. Conclusion

We have examined contract farming in Kenya, the African country where it has been used most extensively. We have shown that it has unequivocally contributed to higher income for smallholders. We have outlined the niche where its role is particularly important: crops where perishability makes close coordination especially important (thus making spot markets inefficient) and where the importance of careful husbandry and costly supervision of labor yield diseconomies of scale in farming. Where the first condition is absent, contracting may be a useful way to introduce a new crop to smallholders, but it is likely to give way to spot markets in the long run.

Contract farming is an important means of overcoming market failures. It can work well in spite of gross imperfections in markets for inputs, including land, labor, capital, and especially information, regarding both demand and growing practices.

In addition, we have examined some of the important features of contracts. We found that contracts that use formula based prices are better in a broader set of conditions than are fixed price contracts, and should generally be encouraged. We also conclude that the use of more complex pricing structures, including differentials for quality, should be encouraged, instead of contracts that merely specify farming practices. Further, we submit that, although there may be some theoretical basis for creating more enforceable contracts, the potential for monopsonistic abuse is substantial. We have therefore recommended other measures the state can take to facilitate voluntary compliance by farmers.

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Table 1
Income and Wealth by Types: 1986
For Urban and Rural Households

Variable	Means	Comp*	Stan. Dev.	% own**
Urban Households				
Household size (person)	3.83			
Total annual income per household (yuan/year)	3360	100	1644.37	100
of which:				
Regular income	2837	84.5	1141.32	97.5
of which: wage	2348	69.9	1101.17	96.3
bonus	489	14.6	747.04	86.7
Irregular income	315	9.4	861.51	41.9
Total wealth (yuan)	4922	100	3693.12	
of which:				
Financial assets	2168	44.0	2649.80	
Value of durables	2754	56.0	2008.72	
Wealth/income ratio	1.46			
Rate of annual saving	Ranged from 5.5% to -4.9% depending on age			
Rural Households				
Household size (person)	4.98			
Total annual income per household (yuan/year)	2145	100	1503.28	100
of which:				
From hh. activities	1783	83.4	1360.21	99.6
of which: agric. income	1436	66.9	982.91	98.6
Manufacturing & construction	111	5.2	424.32	16.2
Other activity	220	10.2	483.99	55.5
Total wealth (yuan)	4244	100	5527.99	
of which:				
Financial assets	747	17.6	3164.83	95.6
Value of durables and tools	888	20.9	2812.48	94.9
Value of housing	2609	61.5	3146.72	96.8
Wealth/income ratio	1.98	(0.76 if the value of housing is excluded)		
Rate of annual saving	Ranged from 7.6% to -5.1% depending on age.			

Source: Author's calculation from the CASS data (3860 urban, 3648 rural households).

* This column is the percentage of the type of income (wealth) in total household income (wealth).

** This column is the percentage of households receiving (or possessing) the type of income (or type of wealth).

in Africa, inadequate government commitment has been a serious barrier to reform (World Bank, 1988). However, while the economic aspects of structural adjustment rest on the powerful tenets of neoclassical theory, it is striking that there is no comparable set of analytic tools to guide the political dynamics of reform.

In order to better understand the political dimensions of economic reform, this paper examines Ghana, perhaps the paradigmatic "soft" state in Africa given the comprehensiveness of its interference in the economy and its resultant decline, as it has attempted reforms in the particularly contentious area of exchange rate policy since 1983. Ghana, under the government of Flight Lieutenant Jerry Rawlings, is a particularly good case study because the reforms it has implemented go beyond simply changing relative prices. Instead, the government has altered fundamental economic institutions governing the exchange rate and is therefore seen by the World Bank and many others as a model for African countries. A study of the Ghanaian experience will therefore yield potentially important lessons for radical economic reform in other African countries that face similar problems.

Ghana is particularly interesting because the leadership self-consciously adopted a strategy designed to overcome the specific local factors that were impeding exchange rate reform. In the main, this strategy was successful. Of course, the government's correct analysis of local political factors and its subsequent design of an appropriate strategy are not the only reasons that it has been able to implement economic reforms that were long thought to be impossible. Other factors -- luck, political repression, weariness from a decade of decline -- also contributed to the Rawlings regime's success. However, Ghana is a good case for examining political strategy, the neglected aspect of economic reform.

2. The Dilemmas of Exchange Rate Reform

Given the relatively open nature of African economies, the exchange rate is one of the most important aspects of government economic policy. Unfortunately, in the face of balance of payment problems, African countries have consistently chosen to control imports administratively in large part because this type of import regime offers far more political benefits. Under a market-determined import regime, no importer can be favored or discriminated against because they all face the same prices. In a system of tariffs and quotas, however, a government is able to allocate selectively import licenses and apply different levels of protection to industries in order to reward clients. Indeed, in

impoverished African countries, allocation of an import permit is almost a license to print money, because those few who are able to bring in foreign goods will be assured of making a large profit.

Unfortunately, reliance on an administrative system to control imports often leads in practice to an overvalued exchange rate. If leaders depend on administrative controls rather than the exchange rate to ration imports, they often do not feel compelled to adjust the exchange rate to reflect differences between domestic inflation and the inflation rates of their trading partners. Correspondingly, exchange rate reform is especially difficult because the old import regime, no matter how economically disastrous, will usually benefit politically important actors. Also, because external trade is such an important aspect of all African economies, there may be a great deal of popular sentiment against changing the rate, no matter what the economic rationale.

Ghana is an excellent example of how exchange rates can become distorted and how difficult it is to reform them. Ghana achieved independence in 1956 and has suffered for many years from what Naomi Chazan correctly calls a "political recession".(Chazan, 1983). Ghana, almost from the very beginning, was a case study of all that could go wrong with an African state. Successive civilian and military governments continually distorted prices, exchange rates, and public enterprises in order to encourage clients and to enrich themselves (Price, 1984). Indeed, the Ghanaian state interfered with its economy to an extent perhaps unequaled even in Africa. The World Bank found in its 1983 study of government intervention that Ghana had one of the most distorted economies, and, not coincidentally, one of the lowest growth rates, of any of the 32 countries it surveyed (World Bank, 1983).

By the early 1980s, due in good part to exceptionally poor economic management, the Ghanaian state had effectively collapsed. Between 1976 and 1982, real Gross Domestic Product per capita decreased by 3.4% each year, prices increased at a yearly average of 66.8%, and unemployment grew (Chand and van Til, 1988). Shortages of basic goods and foodstuffs became common. The government was increasingly encumbered by the necessity to enforce regulations and price controls that bore less and less relationship to reality. Indeed, as the economic crisis increased, the state was not even able to reward those groups upon whose support it depended (Chazan, 1983, p. 338). Richard Hodder-Williams was perhaps exaggerating only slightly when he claimed that by the early 1980s, "To some extent, Ghana is a state only because the outside world asserts that there is a Ghanaian State" (Hodder-Williams, 1984).

Perhaps the best example of how state deterioration and economic decline interacted in Ghana was the exchange rate. Ghana's history of exchange rate problems began with economic

crises in the early 1970s. In December 1971, in response to a declining economic position, the government of Prime Minister K.A. Busia announced a surprise devaluation of 78%, thereby reducing the value of the cedi from 1.02 to the dollar to 1.82 to the dollar. The devaluation was quickly followed by a coup led by Colonel I.K. Acheampong, and the military government that followed revalued the cedi to 1.28 to the dollar in February 1972 (Leith, 1974). In the ensuing years, the exchange rate was largely held steady while Ghana experienced considerable inflation resulting in the rapid overvaluation of the cedi. In 1972, the black market rate for the cedi was 22% greater than the nominal rate. By 1975, when the cedi was nominally valued at 1.15 to the dollar, the black market rate was at 2.9 to the dollar (60% over the official rate). By 1982, the cedi had only fallen to 2.75 to the dollar, but the black market was at an incredible 61.6 to the dollar (an overvaluation of 2,242%) (Wood, 1988).

The great overvaluation of the cedi spawned a huge and thriving black market as goods became unavailable at the quoted price. In 1980 the government implicitly admitted that it had lost control of the situation by creating a system of special unnumbered licenses which allowed Ghanaians to import goods but which did not allocate any foreign exchange for this purpose. Potential importers were therefore encouraged to bid for funds on the black market (Huq, 1989).

The overvalued exchange rate also had an important effect on exporters. Prices for the country's major export, cocoa, were artificially low, and Ghana's export farmers therefore either stopped producing or smuggled their produce across the border to Côte d'Ivoire, which was offering much higher prices because of a much more realistic exchange rate. Ghana's share of the world cocoa trade shrank from one-third in the 1950s and 1960s to one-sixth in 1979 as total cocoa production decreased from 556,000 metric tons in 1965 to 249,000 metric tons in 1979 (World Bank, 1981). Other exporters were also hurt, with the result that the value of total exports in constant cedis in 1980 was only 52% of the 1970 level, while exports in 1981 were only 32% of what they had been eleven years before (World Bank, 1984).

There were several reasons why successive Ghanaian governments were unable to reform the exchange rate even though there was widespread agreement among senior civil servants and many government officials that the severe overvaluation of the cedi was seriously hurting the country. First, the system of administrative allocation of foreign exchange was extremely useful in rewarding clients because, in a climate of ever-greater scarcity, the allocation of an import license was a

powerful means of developing and retaining constituencies.[2] Many of those who had benefited from the overvalued exchange rate were either in government or had become the primary supporters of successive governments.

Second, there was a widespread belief among the urban population, the chief consumers of imported goods, that they actually benefited from an overvalued exchange rate and would be hurt by any kind of devaluation. One contribution to the Ghanaian debate concerning devaluation in 1982 (tellingly titled "The Revolution or the IMF") argued, "it is also important to point out that whenever there is a devaluation of the currency the ordinary people are those who suffer most from the resultant price increases, unemployment, and cuts in social services.[3]

Third, there developed in Ghana a powerful psychological attachment to the idea of a "strong" (that is, overvalued) cedi. This idea is not easy to describe, but the concept of a "strong" currency came to appeal to many elements of the polity. In part, the need to have a "strong" cedi was tied to the desire of many Ghanaians, who had seen their once proud country decline into bankruptcy, to recapture some of the nationalistic spirit of the past by confronting international financial institutions. David Anafglatey spoke for many Ghanaians when he said,

> It is as if the IMF is some sadistic monster which becomes angry at seeing people happy...One also recalls with pride how Ghana's own *Osegyefo* (Kwame Nkrumah) rejected the Fund's pressures to devalue the cedi in the early 1960s....Unfortunately many of the leaders Ghana has had after Nkrumah have not had the courage of the *Osegyefo*. They spinelessly yield to the IMF pressure....(Accra Domestic Service, in English, 1982b, p. 36)

For the leadership, the attachment to a "strong" cedi manifested itself in an association that developed between devaluations and coups after Acheampong overthrew Busia.[4] Dr.

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[2] See, *Report of the Commission of Enquiry into Alleged Irregularities and Malpractices in Connection with the Issue of Import Licenses* (Akainyah Commission) Accra: Government Printer, 1964, p.12 and *Report of the Commission of Enquiry into Trade Malpractices in Ghana* (Abraham Commission), Accra: Government Printer, 1965.

[3] The *Daily Graphic* added the appellation "People's" on 31 December 1982.

[4] There is, in fact, substantial evidence that the Acheampong coup was planned well beforehand and would have happened even without the devaluation. However, the political

Joseph Abbey, a key member of Ghana's present economic management team, outlining previous governments' fears concerning the exchange rate, thus:

> Procrastination of successive governments over a prolonged period in refusing to adopt appropriate stabilization policies destroyed the country's economy, given the widespread belief that a stabilization policy, especially devaluation of the exchange rate inevitably conjured up threats of a coup in Ghana. (Abbey, 1987)

There is perhaps no better example of how a disastrous economic policy can become politically essential in the official mind of an African government.

Finally, devaluation does require a leap of faith by the national leadership because while the deleterious effects (e.g., higher prices for imports) are guaranteed to be immediate,the beneficial effects -- increased production by exporters who receive better prices for their goods -- will take some time and are always viewed as somewhat tenuous by African leaders well aware of weaknesses in their country's infrastructure and private sectors.[5] The belief of then Foreign Affairs Secretary Dr. Obed Asamoah that there is "realization that some adjustment has to be made in the exchange rate of the cedi, but at the same time there is some feeling in the country that success stories based on IMF devaluation prescriptions are hard to come by" was also a common one in Ghana.[6]

None of these factors is unique to Ghana, but because they were all so strong, they may have caused the country to have an unusually poor exchange rate policy. For instance, in many other countries, exchange rates have long been used to benefit a segment

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mythology that developed afterward was that the devaluation was directly responsible for the toppling of the Busia regime. See, Thomas Callaghy, "Lost Between State and Market: The Politics of Economic Adjustment in Ghana, Zambia, and Nigeria," in Joan M. Nelson (ed.), *Economic Crisis and Policy Choice: The Politics of Adjustment in the Third World*, Princeton: Princeton University Press, 1990, p. 272.

[5] See, for instance, Governor of the Central Bank J.S. Addo's speech, "The Justification for Devaluation under the Economic Recovery Programme, 1983-6, " reprinted in *The State of the Economy*, number 2 Accra: Information Services Department, 1986, p. 22.

[6] The *Daily Graphic*, 6 October 1982.

of the population.[7] Similarly, the fear of "IMF riots" due to exchange rate reforms or other aspects of structural adjustment is quite a common one in Africa and elsewhere in the developing countries.[8] Finally, resistance to exchange rate reform in particular has a psychological aspect in Africa. General opposition to the IMF and The World Bank usually centers around the exchange rate -- a widely followed indicator in most countries -- and in many African countries the exchange has become, for better or worse, an important nationalistic symbol.[9] For instance, in the early 1980s both Nigeria and Tanzania resisted devaluation in good part because of the psychological and nationalistic investment that had been made in a particular rate of exchange. This aspect of African politics may seem peculiar to westerners who are inclined to see the exchange rate as just another aspect of economic policy, but the psychological importance in the exchange rate should not be underestimated. In a country like Ghana, where the psychological aspect of the exchange rate becomes intertwined with leadership fears of a coup, the emotions surrounding devaluation may become a formidable barrier to reform.

3. The Politics of Radical Economic Change

The drastic reforms in the exchange rate regime that the Rawlings government has carried out are therefore particularly important. However, it was not immediately obvious that the government of Flt. Lt. Jerry Rawlings, which overthrew the civilian Third Republic on 31 December 1981 was going to make radical changes in the exchange rate regime. Indeed, in the first year after the coup, a policy of dramatic proclamations coupled with insignificant policy measures was exactly the course the regime followed. The new Provisional National Defense Council (PNDC) repeatedly noted that it would not devalue the cedi.[10] Instead, in the PNDC's four-year economic program announced in

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[7] See, for instance, The World Bank, *Accelerated Development in Sub-Saharan Africa* , Washington, DC: The World Bank, 1981, p. 28.

[8] See, Henry S. Bienen and Mark Gersovitz, "Consumer Subsidy Cuts, Violence, and Political Stability," *Comparative Politics* 19 (1986), pp. 25-44.

[9] I discuss this development at greater length in "The International System and the Weak State: The Politics of the Currency in West Africa, 1900-1990," mimeo.

[10] See, for instance, Accra Domestic Service in English, "PNDC Member Says Cedi Will Not Be Devalued," 15 October 1982 quoted in *JPRS-SSA*, 18 October 1982, p. T3.

December 1982, it devoted itself to establishing a state monopoly on export-import trade, eliminating corruption in the allocation of import licenses, and trying to re-orient trade away from the West.[11] There were also many attempts to coerce traders into making goods available at controlled prices, sometimes by resorting to rather blatant physical force. The Rawlings regime instinctively adopted the old measures of trying to cure the ills of an overexpanded state by adding to the state's burden. Even the usually sycophantic Ghanaian press observed in April, 1982, that the regime had no economic policy to speak of (Accra Domestic Service, in English, 1982a). Certainly, the Ghanaian government in 1983, after one year in power, had to be viewed as weak, without a commitment to reform, and as lacking a strong administrative structure to carry out reform if it wished to embark on drastic changes in the economy. It was precisely the kind of government that would not have been able to implement a program of structural adjustment that challenged the operation of fundamental state institutions and practices.[12]

It was also unlikely that the Rawlings regime would embark on radical economic reform, and particularly devaluation, because of the regime's constituency. Rawlings came to power seeking, in his own words, "nothing less than a revolution."[13] With a flourish of populist and socialist rhetoric, the government sought to mobilize workers, students, and the rest of the urban population in order, through unspecified policy measures, to facilitate radical change in the economy. Worker's Defence Committees (WDCs) and People's Defence Committees (PDCs) were established to mobilize the population, and quite a bit of organization was done on the shop floor (Hansen, 1987). It is, however, crucial to note that the early supporters of the regime tended to be net importers who would undoubtedly oppose any effort at exchange rate reform. On the other hand, the peasantry, and notably the cocoa farmers who are the nation's most important exporters, adopted a "wait and see" attitude and were generally apprehensive (Hansen, 1987).

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[11] *Ghanaian Times*, 31 December 1982.

[12] See, for instance, Joan M. Nelson, "The Politics of Stabilization," in Richard E. Feinberg and Valeriana Kallab (eds.), *Adjustment Crisis in the Third World* , New Brunswick: Transaction Books, 1984, pp. 101-2 and Anne C. Krueger, *Liberalization Attempts and Consequences*, New York: National Bureau of Economic Research, 1978, p. 223.

[13] Radio Broadcast to the Nation, 31 December 1981, reprinted in *A Revolutionary Journey: Selected Speeches of Flt. Lt. Jerry John Rawlings*, vol. 1, Accra: Information Services Department, n.d.), p.1.

Yet, by the end of 1982, there was a developing consensus within at least part of the PNDC that the bitter medicine of the IMF, especially devaluation, would have to be taken. This turn of events occurred partially because the Rawlings government found that the Soviet Union and its allies would not offer Ghana economic aid; indeed, it appears that the Soviets advised Ghana in 1982 to turn to the IMF. The lack of aid from socialist states served only to reinforce the growing realization by the new leadership that their radical rhetoric did not automatically lead to a set of policy prescriptions, especially when much of the rest of the world was trying to reduce state intervention in its own economies. The attempts at coercing traders produced a brief spurt of cheap goods on the market, and then the country experienced even greater scarcity as traders avoided open sales completely.

Finally, 1982/1983 was an absolutely disastrous time because a drought and the resulting bushfires devastated most of the agrarian sector, and Nigeria expelled approximately one million Ghanaians who had been working illegally in that country. These disasters quickened the new leadership's search for some kind of solution to Ghana's problems. Talks therefore began with the World Bank and the IMF.

4. Changing the Psychology of Devaluation

The fundamental problem that government leaders and civil servants faced was that they needed to overcome the psychology of the country that accorded such an important place to a "strong" cedi both for the continuing welfare of a large part of the urban population and for government survival. In order to break the mass psychology, the first thing that the government did in late 1982 was to raise the price of imported food -- until then artificially cheap because of the exchange rate -- so that it was equal to the price of locally produced food. Government officials explained that this was done to offset some of the psychological dependence on imported goods and to demonstrate to the population how imported foods were hurting peasant growers (Tsikata, 1988).

The new government then moved dramatically to address the overvalued exchange rate and a host of other problems in the 1983 budget. The government's key action was to impose a system of bonuses for exporters and surcharges for importers that lowered the effective value of the cedi from 2.75 to the dollar to 25 to the dollar. Petrol was initially assigned a lower surcharge so there was effectively another exchange rate for fuel imports (Information Services Department, 1983). Given the collapse of the statistical system in Ghana, policymakers and IMF officials

had great difficulty in estimating the extent of the needed devaluation. It was hoped that this initial devaluation would at least return the economy's competitiveness to the level it had achieved in 1978, after the last exchange rate adjustment (Johnson, et al., 1985).

The IMF and the World Bank normally oppose surcharge and bonus systems that amount to a multiple exchange rate because they can be extremely difficult to manage and may delay the adoption of a correctly valued, unified exchange rate. However, Ghanaian officials argued that given the political realities of the country, they simply could not announce the outright devaluation. The multiple exchange rate, they argued, enabled them to begin to address the exchange rate problem while suggesting to the population that they had not simply capitulated to the IMF and adopted a devaluation. Thus, Mrs. Aanaa Enin, a PNDC member, could assure Ghanaians that, "the government has not devalued the cedi but has rather readjusted it to meet the economic conditions of the times."[14] Many civil servants argued that the multiple-tier exchange rate was also important because a substantial portion of the political leadership was against devaluation and they therefore needed to adopt a strategy that could not be called "devaluation" outright.[15] Indeed, the Cabinet spent two meetings simply searching for the right terminology to avoid using the word "devaluation."[16] This attempt to forge common ground was a particularly important consideration because the PNDC -- a group of military and civilian officials who ranged in ideology from those who were known as "Nkrumah's children" to firm believers in the IMF's basic analysis -- was by no means united around reform. The multiple exchange rate system therefore gave the different factions of the PNDC a common place to meet without any group having to admit total defeat.

Once the multiple-tier system had been established and it was shown that a Ghanaian government could actually implement exchange rate reform, it was easier for those who favored devaluation to make their case within the PNDC. In addition, the reform program that Ghana announced immediately drew a significant amount of support from international donors. Ghana had been one of the the lowest per capita recipients of aid in the 1970s, but donors were impressed by the reforms that the PNDC carried out, and the World Bank found it convenient to use Ghana as a showcase. Since 1983, aid

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[14] *People's Daily Graphic*, 20 May 1983.

[15] Interview, Accra, 21 July 1989.

[16] See the article by former Cabinet member Zaya Yeebo, "How the IMF Tamed a 'Leftist' Apostle," *Africa Events*, January 1985, p.19.

flows have averaged US$530 million a year (Financial Times, 1989). Therefore, supporters of exchange rate reform were able to demonstrate to their Cabinet colleagues that the stabilization program could immediately attract outside resources. The World Bank and the IMF also provided a framework for the analysis of Ghana's problems, which was much more persuasive than anything opponents of structural adjustment could develop.

Of course, most Ghanaians realized immediately that imports would be more expensive, and the 1983 budget, which also raised prices on a host of consumer goods, was widely denounced by the government's erstwhile constituencies. For instance, the General Transport and Chemical Workers called the budget "anti-people, a killer, callous and inhuman."[17] The Trade Union Congress (TUC) later protested Ghana's,

> submission to the dictates of the IMF and the World Bank and urged it to wrestle the country's economy from the grip of these financial institutions. As a result of these IMF conditions, working people in Ghana now face unbearable living conditions which manifest themselves in poor nutrition, high prices of goods and services...[18]

There were also widespread protests by students and other urban dwellers who were severely affected by the government's policies.

The PNDC, never really able to stand public criticism, made no effort to placate the disaffected groups. Finance Secretary Kwesi Botchwey said of the unions,

> the sudden alliance between certain negative elements in society and workers following the release of the 1983 budget is an attempt by such elements to hide behind legitimate workers' grievances and subvert an economic programme meant to put the economy right.[19]

Similarly, stories quickly started appearing in the government-controlled press that the U.S. Central Intelligence Agency, which occupies place of pride in the PNDC's demonology, was helping the students.[20]

Despite the protests, the government was able to implement the system of bonuses and surcharges. In part, of course, this was

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17 *People's Daily Graphic*, 30 April 1983.
18 *People's Daily Graphic*, 10 November 1984.
19 *People's Daily Graphic*, 27 April 1983.
20 *People's Daily Graphic*, 6 May 1983.

because people knew that Rawlings, who had executed three former leaders of the country when he had seized power briefly in 1979, was willing to use force to get his program through. As one government official said,

> This government was prepared to take action. It also had a strong constituency among those who hold the gun. The population knows that if you complain, you will be silenced. If you did misbehave you would be taken care of.[21]

Or, as Professor A. Adu Boahen noted in his courageous Danquah lectures,

> "We have not protested or staged riot not because we trust the PNDC but because we fear the PNDC! We are afraid of being detained, liquidated or dragged before the CVC (Citizens' Vetting Committees) or NIC (National Investigations Committee) or being subjected to all sorts of molestation" (Boahen, 1989, pp. 51, 52).

The willingness to use force was, however, combined with the legitimacy that Rawlings had achieved from his "housecleaning" in 1979 and the support he had gained personally. As one official explained in Accra,

> The PNDC regime had a comparative advantage in making reforms just like Nixon had a comparative advantage in going to China. It is a populist regime. People believe that Rawlings is for them. He convinced them that nothing else is possible and they believed that it must be true. A professor from Legon or a rich businessman would not have been able to get away with devaluation.[22]

Therefore, it was not simply a question in Ghana of a government that was prepared to use force to implement a policy; after all, other governments in Ghana had no hesitation about locking people up. Rather, the Ghanaian government succeeded in part because it was able to use a particularly effective combination of coercion and legitimacy to deter outright opposition.

Further, there is some evidence that the multiple exchange rate system did work to alleviate some of the psychological

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21 Interview, Accra, 26 September1989.

22 Interview, Accra, 14 July 1989.

disposition against devaluation. Thus, the Trade Union Congress (TUC) in 1988 argued that a system of bonuses and surcharges, "is better than the traditional devaluation which does not discriminate in its scope and level." (Trade Union Congress, 1988, p. 2) Actually, there were very few exemptions in the system of bonuses and surcharges that the government announced in 1983, but the fact that it left government with some opportunity to intervene in the economy was important.

The Ghanaian government may also have faced less popular opposition than it expected because, given the gross overvaluation of the cedi, there were very few goods on the shelves of stores (and nothing in the markets) that were priced according to the official rate. In retrospect, government officials are quite confident that more widespread worker protests against the budget announcement and subsequent reforms did not emerge because most of the society was already paying shadow world prices for commodities. This is an important point that is usually ignored when government officials and multilateral organizations attempt to estimate the effects of a devaluation on the public.

Also important was the fact that the Rawlings regime was able to retain the support of the one constituency that really did matter, the military. The government has had to quell several coup attempts in the last few years; indeed, most of the members of the original PNDC leadership fell rather quickly from power in disputes over policy or leadership. However, in 1982, before the government had announced its dramatic devaluation, there were significant threats to the government, and it is difficult to tie any of the coup attempts specifically to the devaluation. Rawlings survived the early years of this government because of luck, skill, and his own personal popularity among the lower ranks of the military. As the economy began to grow after 1982, it became harder for potential opponents to oppose Rawlings on policy grounds.

The PNDC regime quickly moved to consolidate its exchange rate reforms by unifying the import and export rates at 30 cedis to the dollar in October 1983. Thus, in five months the cedi had undergone a nominal devaluation of 1,090%. The government then linked the exchange rate to an index of the difference of the inflation rate between Ghana and its major partners. Between October 1983 and January 1986, the government announced periodic devaluation of the currency, sometimes considerably more than was called for by its own formula, so that by the beginning of 1986 one U.S. dollar was equivalent to 90 cedis (Ewusi, 1987). According to government officials, the PNDC repeatedly "tested the waters" to see how large a devaluation would be tolerated. As Figure 1 demonstrates, these administrative announcements resulted in a dramatic real devaluation of the cedi.

5. Deflecting Political Pressure

The government carried out these devaluations at considerable political cost. The workers had become largely alienated, in good part because each newspaper reporting the latest devaluation also reported that petrol and other commodities were increasing in price because of the new exchange rate.[23] In a remarkable statement for a country that still suffers from what Rawlings calls "the culture of silence," A.K. Yankey, head of the TUC, said in late 1985, "workers out of frustration would be forced by their human instinct of survival to rise up against the Government since it cannot ensure them their survival."[24] The students were also largely alienated from PNDC, and the universities had to be shut for a considerable period of time because of student protests.

Perhaps most important, by early 1986, senior government officials were beginning to voice, in public, serious concerns about the political implications of continued exchange rate reform. In a bold challenge to government policy, Lt. Col. (ret.) J.Y. Assasie, who was at that time Political Counsellor for the Economic Development of the Committees for the Defence of the Revolution (as the WDCs and PDCs had been renamed), said,

> We are of the view, that the burdens that tend to flow from currency adjustments fall disproportionately heavily on the deprived and poorer sections of community without adequate and corresponding compensatory benefits. This sector of our society is the constituency of the Revolution which must not be unnecessarily burdened in the pursuit of growth (Assasie, 1986, p. 16).

Similarly, one Ministry of Finance official said,

> "Exchange rate announcements become more and more difficult with each successive announcement of devaluation. The government began to look bad. Revolutionaries asked if the government was for

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23 For instance, on 5 December 1984 the *People's Daily Graphic* reported a devaluation; the accompanying story on the page concerns an announcement from the Ministry of Fuel and Power that fuel prices were increasing because of the new exchange rate.

24 *The Pioneer*, 25 November 1985.

> the workers. Every devaluation brought an increase in prices."[25]

By this time, government officials admitted that they faced too much popular pressure simply to continue the practice of administrative announcement of devaluations. There was also some unhappiness expressed by government officials that the process for setting rates administratively, which involved the Ministry of Finance, the Bank of Ghana, and the PNDC, was far too cumbersome to continue indefinitely.

In addition, while the devaluation had hurt a large number of people, explicit supporters of the government's economic policy were still relatively scarce. Although farmers' incomes were increasing, cocoa production was only at 186,000 metric tons in 1985, an increase from 1983's level of 158,000 metric tons but still well below the 258,000 metric tons achieved in 1980 (Botchwey, 1987). Of course, the slow response by cocoa farmers was hardly surprising given that it takes five to seven years after a tree is planted for it to begin yielding cocoa beans. Thus, there was no obvious manifestation of rural support for the government, and the PNDC was still grappling with the fact that its institutional ties with the countryside were extraordinarily weak.

Faced with these problems, the government decided to institute a foreign exchange auction that constituted a "second window" for foreign exchange allocation. As Dr. Botchwey noted, the auction tended to "depoliticize" currency adjustments because the government could plausibly deny that it was responsible for further devaluations and just blame it on the market.[26] Similarly, an editorial in a local newspaper noted how the auction deflected blame away from the government,

> Each and every Ghanaian, therefore, must be aware that the way he or she goes about the tasks and responsibilities of daily life will be reflected in the weekly auction results. We can no longer hide from the truth or blame it on international financial institutions or economists who talk a language which we don't understand...it is our efforts which will determine the weekly economic temperature.[27]

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[25] Interview, Accra, 25 July 1989.

[26] Quoted in Baffour Agyeman-Duah, "Ghana, 1982-6: The Politics of the P.N.D.C.," *The Journal of Modern African Studies* vol. 25, no. 4, December 1987, p. 635.

[27] *People's Daily Graphic*, 15 September 1986.

Ghanaian officials report that they opted for an auction, instead of an interbank market, in part because of the perceived weakness of the commercial banking system.[28]

In the first week, the value of the cedi decreased by almost 42% to 128 cedis to the dollar. The government soon confirmed its commitment to the auction by closing the first foreign exchange window so that the auction became the sole means of foreign exchange allocation in the country.

The auction continued the gradual devaluation of the cedi with the exchange rate reaching 362 cedis to the dollar by April 1991. The chart indicates that the auction did bring about a further real depreciation of the cedi even though there was substantial slippage after the auction was instituted.

The same groups that had been disaffected before by the devaluation continued to be unhappy, but there is very little evidence that they posed any kind of threat to the regime. Yet, even the auction, which seemed to institutionalize the government's commitment to an exchange rate favorable to exporters, did not generate new support for the government. Agriculture is still improving but, once again, there is little obvious political support from the countryside. The business community is also ambivalent about the exchange rate reforms, even though structural adjustment programs are designed to promote the private sector. However, many businesses are presently doing poorly because they responded to the price signals transmitted by successive Ghanaian governments and established inefficient industries behind high tariff walls. As the country devalued and these tariffs were reduced, some Ghanaian businesses were suddenly faced with strong competition from imports. Companies in the garment, leather-processing, cosmetic, and plastic sectors have been gravely threatened by new competition with imports. The depreciation of the cedi also caused severe liquidity problems for many industries, especially those that had borrowed foreign funds under the old rate of 2.75 cedis to the dollar.[29]

Another potential constituency for the government is new businesses that might emerge because of the changes in the exchange rate. However, because of the bottlenecks in the Ghanaian economy, there will be relatively few exporters who will be able to benefit from the new exchange rate over the short

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[28] The issues involved in the choice are discussed in Peter J. Quick et al., *Floating Exchange Rates in Developing Countries: Experience with Auction and Interbank Markets*, IMF Occasional Paper no. 53, Washington, DC: IMF, 1987, p. 13 and pp. 32-33.

[29] See, J.K. Richardson, "Speech by the President of the Association of Ghana Industries," Accra, mimeo, 23 February 1989, p. 8 and p. 11.

term. The road, banking, and communication systems are in such a state of disrepair that even drastic changes in the exchange rate will not prompt a quick boom of new exporters who will owe their prosperity to the PNDC government. According to figures supplied by the Bank of Ghana, there has not been a noticeable increase in the amount of foreign exchange allocated to non-traditional exporters during the first three years of the auction's operation.[30]

Further, the PNDC government has made little effort to develop ties with business that might replace some of the constituencies that it lost when it embarked on radical economic change (Paul, 1990). Ghanaian businessmen report that the government has made almost no effort to consult with them during the years of economic change. One businessman called the actual exchange rate "the business of the government," although that rate will directly affect the viability of many businesses in Ghana.[31] Similarly, members of the Chamber of Commerce complained,

> we have suggested what the actions should be, at what rate the exchange rate would be changed, but it is difficult to find an official....Business is not influential. There is no consultation with government. We have government by decree. Our contribution is after measures have been taken.[32]

It may be that government leaders, fully aware of the weaknesses of Ghana's industry, decided that businesses were too insignificant to cultivate as a constituency. Even after five years of recovery, industry (excluding mining and quarrying) only accounted for 14.2% of total economic activity in 1988 (Statistical Service, 1989). Also, the remnants of the populism of 1982 and early 1983 may have deterred government leaders even after they had adopted a structural adjustment program, from developing too close a public or private relationship with the private sector.

The PNDC did make a strong effort to try to educate people about the dangers of the previous economic policies and to demonstrate how the new program of economic reform would eventually help them. For instance, Dr. Botchwey criticized their previous governments' policies of overvaluing the cedi in his 1983 budget speech, "The real losers in this exchange rate policy are of course the working people, the underprivileged who have no

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[30] Unpublished Bank of Ghana statistics indicate that only 0.18% of the funds allocated in the first 143 auctions went to non-traditional exports.

[31] Interview, Accra, 20 July 1989.

[32] Interview, Accra, 11 July 1989.

access to foreign exchange."[33] The government further stressed its commitment to help those hurt by the economic reform program by adopting the most ambitious program on the continent to alleviate the social costs of adjustment. The Program of Actions to Mitigate the Social Costs of Adjustment (PAMSCAD) will not reverse the significant changes that devaluation has brought about, but the food-for-work and redeployment efforts are a signal to the population that the government understands the deprivations that the population has been forced to undergo. In its justification of PAMSCAD, the PNDC specifically noted that the program would contribute to the sustainability of the economic reform program by showing that the government cared about the harmful aspects of structural adjustment and that it was not a simple pawn of the IMF (Ghana, 1987). There is no evidence that these efforts to educate the public about the dangers of overvaluation and to show that the government cared about the population were successful in generating support for the devaluation program, but they may have dampened outright efforts to oppose the economic reform program. A Bank of Ghana official claims, for instance, that the intensive education efforts produced a "resigned acceptance" to the devaluation program.[34]

6. Factors Favoring Devaluation

Although there was little overt support, the task of exchange rate reform was eased by several developments after 1982. First, and perhaps most importantly, the economy began to grow again. Since 1983, it is generally estimated that the economy has grown at approximately 6% a year, a spectacular performance given that most of Africa has suffered from depression for most of the 1980s (Ghana, 1989). The Ghanaian response was actually much greater than predicted by World Bank models, mainly because of the relatively large amount of unused capacity (World Bank, 1990).

It should be noted that part of the growth was also due to the simple fact that the weather improved after 1983. As Dr. Abbey noted,

> We literally took advantage of the drought of 1982-83 to launch our program. It was clear to us that if we waited until after the harvest improved, it would be a lot more difficult to launch an austerity program, which we knew the country needed (Abbey, 1989).

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33 *People's Daily Graphic*, 25 April 1983.

34 Interview, Accra, 26 July 1989.

Also, as noted above, Ghana found that the supply of international aid was extremely elastic once it began to institute its reform. The injection of the aid had the effect of producing immediate, visible signs that the economy was starting to improve even when most of the Ghanaian private sector was moribund. There is no firm evidence that the lot of the average Ghanaian has actually improved dramatically, but certainly it is evident to everyone that the pace of the economy is accelerating.

In February 1988, the government embarked on further liberalization of the exchange rate by allowing the establishment of foreign exchange bureaus. These bureaus, which are privately owned, are allowed to trade openly in foreign exchange with no questions asked of either Ghanaians or foreigners who want to buy or sell foreign exchange. As Figure 1 indicates, the establishment of the bureaus led to a further real depreciation of the currency from the auction rate, probably because the auction is partially managed, and some Ghanaians are therefore reluctant to use the auction because they do not want to indicate to the government how many cedis they possess. The establishment of the bureaus was an extraordinary step because it marked the abandonment of the old system where the government had allocated all foreign exchange in favor of one where the foreign exchange rate was either determined by auction, for a limited number of goods, or by a competitive free market. Government officials report that they took this radical step because they recognized that there was a flourishing market for foreign exchange outside official government channels and decided that they would be better off legalizing it and trying to understand the market rather than continuing to ignore a substantial part of the economy. As one official noted, "if you can't beat them, join them."[35]

The bureaus may also serve as a lucrative new form of business for those who previously made their living exchanging money on the black market or through privileged access to government-allocated foreign exchange. Indeed, it is the opinion of some government officials that at least some of the dealers who used to occupy the infamous Cow Lane (Accra's once thriving black market for foreign exchange) have now opened foreign exchange bureaus, but it is impossible to investigate this assertion. It can be said that the incentive system that the government has now established promotes legitimate trading activity (for which the government receives a licensing fee) and that the once vibrant black market has largely dried up.

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[35] Interview, Accra, 10 July 1989.

7. Ghana's Real Devaluation

Ghana's devaluation is significant for several reasons. First, it was not only a nominal devaluation of the cedi by approximately 13,000% but, as Figure 1 demonstrates, it was also a significant real (after inflation) devaluation. This is important because in some countries, especially those that have adopted expansionary fiscal policies, there is a tendency to let the currency appreciate in value so that after a few years the real value of the currency is not significantly different from the period before the devaluation (Edwards, 1988). Figure 1 suggests that after large devaluations there was a tendency for the currency to begin to appreciate. However, when the authorities were determining the value of the currency administratively, they were able to make large enough discrete jumps so that the slippage afterwards was not significant. Each time Ghana went to a new form of foreign exchange allocation (either the auction or the foreign trade bureaus), there was also a significant depreciation that counteracted the tendency for the currency to appreciate.

However, Ghana's devaluation is more than a simple change of prices. By fundamentally changing the way that foreign exchange is allocated, the government has made a far more radical economic change than most African countries that attempt to reform simply by changing relative prices. The fact that the PNDC cannot fundamentally affect the foreign exchange regime provides important credibility, to its long-term commitment to proper exchange rate management and assurance to exporters who can make realistic assumptions about the exchange rate in future business plans.[36] If the PNDC had simply devalued without changing the institutions affecting the exchange rate, it would have much less credibility, and businesses would have no assurance, especially given Ghana's past, that the exchange rate regime would continue. Thus, the type of fundamental change in economic institutions that the PNDC implemented, rather than simply adjusting relative prices, constitutes a real structural adjustment.

8. Explaining Ghana's Success

What explains Ghana's success in carrying out radical economic reform in an area that was so important to cementing

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[36] The importance of credibility in reform efforts is discussed by Deepak Lal, The Political Economy of Economic Liberalization," *The World Bank Economic Review*, vol. 1, January 1987, p. 275.

patron–client relationships in a country that reflected an extreme version of the "soft" state? It is clear that in the Ghanaian case, coalition politics were significantly less important than has generally been suggested in the literature on the state in Africa and on economic reform. Ghana was able to enact comprehensive exchange rate reform while alienating much of its original constituency and not developing obvious new support in the rural areas. All that was really important was that the regime prevent a strong enough opposition coalition from developing in the military that would have caused its overthrow and the probable end of the structural adjustment program.

Alienating important constituencies turned out to be much less important than originally thought, because when the African state reaches a certain stage of decline, interest group pressures on the state may be significantly weaker than are usually realized. Clearly, if citizens are withdrawing from the state, they are no longer so dependent on patron–client ties, and therefore may not have so great a stake in pressuring the state to change its economic policies. As the state disintegrates and patron–client relationships dependent on state largess become relatively less rewarding compared to withdrawal, the potential for the leadership to enact significant economic measures may, paradoxically, become greater. For instance, there were probably very few Ghanaians who benefited from privileged access to import licenses by the early 1980's because the state had so little foreign exchange to distribute. Rent seekers who can control import licenses are usually a potent source of opposition to devaluation, but the crisis had become so bad in Ghana that the group benefiting from administrative allocation of foreign exchange was extremely limited. Indeed, by the early 1980s, the economy had deteriorated to such an extent that even senior government officials, who normally benefit from access to imported goods even in times of shortage, reported that they were going hungry and were concerned that they could not find food for their families.

Given this perspective, it is clear that the brief mobilization of urban popular support that the regime managed in 1982 was the aberration, not its subsequent loss of constituencies. After the 1983 budget was announced, when the Rawlings regime alienated large parts of its constituency, Ghana may simply have been returning to the status quo ante when the population did not offer support to any government and simply concentrated on surviving. However, Rawlings may have created significant problems for his government by raising expectations far beyond what any Ghanaian government could have delivered. The tone of government pronouncements during the recovery program--warning of sacrifices ahead and suggesting that any improvement will be slow in coming--is in sharp contrast to the early promises of "revolution." The difference between the initial rhetoric and

the reality of structural adjustment may be another reason that the regime has had such trouble cultivating political support despite the economy's improvement.

Even though the soft state had imploded, the psychology of the soft state, epitomized by the belief that devaluation would cause burdens on the urban population and prompt a coup, remained. The strategy that the Ghanaian government adopted was therefore especially important in successfully implementing the devaluation. Ghanaian officials argue that their slow approach and adoption in certain periods of multiple exchange rates were crucial in demonstrating to the country that the exchange rate could be reformed. This strategy also allowed the PNDC to proceed with economic reform despite the fact that there were significant divisions among the leadership concerning the nature and pace of economic change. Therefore, a sophisticated strategy on the part of the top leadership may supplant the need for the unified government that much of the economic reform literature declares necessary. The Rawlings devaluation was in sharp contrast to Busia's attempted devaluation, which was done without warning and without adequate planning by the government (Denoon, 1986). It was also dramatically different from the approach of such countries as Zambia where the government was not fully committed to the structural adjustment program, where there was little effort to develop an indigenous political strategy, and where few resources were devoted to educating the public on the benefits of the reform program (Gulhati, 1989).

The Ghanaian case also suggests that in an effort to catalogue the weaknesses of the African state, scholars often mistakenly assume that simply because African states are institutionally weak, they lack the necessary autonomy to make basic decisions about the rules governing institutional allocations. The case of Ghana demonstrates, however, that states can still make certain decisions about basic economic institutions, such as the exchange rate, no matter what the condition of their administrative apparatus. In many instances, African states are prevented from implementing basic decisions because they lack the administrative expertise. Exchange rate reforms, which are really little more than pronouncements, do not require significant administrative experience, especially if the country is liberalizing. Indeed, Ghana's move to free markets actually lessened the administrative duties of the state, once the multiple-tier exchange rate system had been abolished, because the government could eliminate an entire part of the Ministry of Trade that had previously undertaken the onerous task of deciding who would get an import license. Also, the World Bank and the IMF were able to contribute important information and analysis when the Ghanaian government was unable to fully understand a problem.

In addition, the development of a viable political strategy does not require particularly well-developed administrative and institutional capabilities. The strategy that was used to implement the exchange rate reform in Ghana did not involve more than a few high-ranking officials and civil servants. This is why an appropriate political strategy can, to some degree, substitute for the strong institutions and well-developed institutional capabilities that are usually associated with successful economic reform.

9. Lessons for Future Reform

For future reformers, the primary lesson from the Ghanaian experience in terms of strategy is that the World Bank and the IMF have to allow countries more leeway in formulating structural adjustment programs so that they are politically viable. The World Bank and the Fund have developed a powerful analysis of what has gone wrong economically with African countries, but this economic analysis does not have a corresponding political logic. Instead, the Bank and the Fund have simply advocated adopting programs as quickly as possible. In the case of the exchange rate, they have argued for shock devaluations and moving as rapidly as possible toward a floating rate because this strategy would limit speculation. However, shock devaluation of the type demanded by the Bank's and Fund's economic analysis would probably have fallen victim to the exchange rate psychosis that had such a grip on the Ghanaian polity. In order for devaluation to be politically viable, it was important that the Ghanaians embark on the transition step of multiple exchange rates, although the Bank and Fund correctly argue that these are less than optimal strategies to promote economic growth. Thus, Ghana was a success in good part because, while the Bank and the Fund provided the economic logic and a substantial amount of the resources for reform, the Ghanaians themselves developed the political logic to bring about radical changes in the exchange rate. If other reform programs are to be successful, there must be a strong indigenous element to the reforms.

A well-developed political strategy for economic reform does not guarantee successful adjustment. In Ghana and other African countries, there are too many other factors at work to make such a simplistic association. However, an appreciation of the local circumstances inhibiting reform and development of an appropriate strategy will allow a government to take advantage of favorable circumstances (e.g., inflows of aid, previous economic decline) to implement politically contentious reforms. At the same time, governments armed with a political strategy may be

able to cope with hostile external developments and difficult local circumstances when implementing a structural adjustment program. The policy changes that structural adjustment requires are too difficult to allow us to ignore the advantages that a locally developed political strategy provide.

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Auction Quotas with Imperfect Competition

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1. Introduction

One of the most common criticisms of voluntary export restrictions (VERs) and of the way quotas are currently allocated is that they allow foreigners to reap the rents associated with the quantitative constraint. It has been suggested that auctioning import quotas would be a remedy for this. Takacs (1987) points out that such proposals have become increasingly frequent:[1]

> Commissioners Ablondi and Leonard of the U.S. International Trade Commission (ITC) recommended auctioning sugar quota licenses in 1977. The ITC recommended auctioning footwear quotas in 1985. Studies by Hufbauer and Rosen (1986) and Lawrence and Litan (1986) suggested auctioning quotas and earmarking the funds for trade adjustment assistance.[2]

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[1] The interested reader should consult Bergsten et al., (1987) and Takacs (1987) for a historical and institutional perspective on work in this area.

[2] See Takacs (1987), footnote 5.

A Congressional Budget Office (CBO) memorandum[3] estimates quota rents possible in 1987 for a group of industries to be $3.7 billion. The Bergsten et al. (1987) estimate made for the Institute for International Economics (IIE) is $5.15 billion. More recently, Tarr (1989), using a general equilibrium model, estimates these rents in textiles, autos and steel to be even higher -- about $14 billion in 1984.[4]

Despite the importance of the issues involved, the intuition behind such proposals and the procedure used in the estimation of quota rents are both based on models of perfect competition. In such models, the level of the quota determines the domestic price, and the difference between the domestic price and the world price determines the price of a license when auctioned. If the country is small, then the world price is given. If the country is large, then the world price also changes with the quota in a manner determined by supply and demand conditions in the world market.

However, this analysis is misleading when markets are imperfectly competitive. In such environments, prices are chosen by producers, i.e., there is no supply curve, and the response of producers to the constraint must be taken into account when determining the auction price of a license. For example, if the response of profit maximizing producers is to adjust their prices so that there is no benefit to be derived from owning a license to import, its auction price must be zero.

Two policy questions need to be addressed. First, should existing licenses be auctioned off? Here it is vital to specify the existing scheme of license allocation, explicit or implicit, in order to compare auctioning off licenses to the status quo. Second, can quotas be welfare improving over free trade? Here it is important to specify whether all licenses are auctioned off, or whether some are given away to foreign suppliers. It may be better to give some away as this affects supplier behavior. There has been relatively little work done in this area. The work on the effects of quantitative restrictions in imperfectly competitive markets is linked to the above questions,[5] but no analysis of what this might suggest about the price of a license seems to exist.

This paper reports on a series of models of monopoly and oligopoly that address these issues. The models show that the way in which licenses are sold, the allocation of licenses, the demand conditions, and the market structure all influence the resulting price of a license. The results indicate that there is reason to

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[3] Memorandum of February 27, 1987, from Stephen Parker, on revenue estimates for auctioning existing import quotas (publicly circulated).

[4] Tarr (1989) p. 98.

[5] See Krishna (1989b) for a survey of this work.

expect that the price of a license may be much lower than that obtained from models of perfect competition. Thus, estimates of potential revenue such as those of the CBO and Bergsten may be far too large. Moreover, if no revenue is to be raised from auctioning quotas unless they are very restrictive, the profit shifting effect of such policies is unlikely to outweigh the loss in consumer surplus. For this reason, auction quotas are likely to have adverse welfare consequences even when set optimally. I do not argue that in the real world license sales will raise no revenue. They will do so in the presence of uncertain demand, for example, as licenses have an option value in this case, I merely point out that there is reason to expect revenue to be lower than that estimated under the assumption of perfect competition.

The following sections analyze the effects of auction quotas using a series of models of imperfect competition. Section 2 summarizes the results with monopoly and certain demand. Section 3 discusses the option of giving away some of the licenses. Section 4 summarizes the results with oligopoly. Section 5 discusses the effects of uncertainty in models with monopoly and duopoly. Even here, licence revenues are show to be smaller than models of competition would suggest. Section 6 outlines future work research that is needed.

2. Monopoly

This section examines the consequences of quota auctions when there is a monopoly in the product market. If there is a single foreign supplier of the product and markets are segmented, it is clearly optimal for the monopolist to raise price in response to a quota or VER so that the price of a license becomes zero. This model with segmented markets is developed diagrammatically in Takacs (1987) and is mentioned in Shibata (1968) as well, and most recently Helpman and Krugman (1989). The analysis in this section is based on Krishna (1990a).

2.1 Foreign monopoly with costless arbitrage

Suppose there is costless arbitrage between the markets so that the foreign monopolist cannot practice price discrimination.[6] One would expect the monopolist to limit price increases in response to a quota in this case, thereby creating a price for the license. Somewhat surprisingly, this is not

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[6] There may be domestic competitive supply, in which case the monopolist's demand in what follows should be interpreted as the residual demand curve.

necessarily so. Quotas set close to the free trade level always have a zero price: all that occurs is an increase in the world price.

At this point, it is important to be clear about exactly what constitutes a license, how licenses are sold, and the timing of moves. With market segmentation, a license is a piece of paper that entitles its possessor to buy one unit of the product in question at the price charged by the seller in his market. In other words, it is a property right. If arbitrage is possible, then the possessor buys at the lower of the prices charged by the seller in the home and the world market. However, it is a dominated strategy for the monopolist to attempt to charge different prices in his different markets, since sales will only be made at the lower of the two prices. For this reason, the monopolist is restricted to choosing only one price.

The licenses are sold in a competitive market either to competitive domestic retailers with zero marginal costs of retailing or to consumers directly. I assume that the timing of moves is as follows: first, the government sets the quota; then the monopolist sets price; finally, the market for licenses clears. This timing is consistent with the idea that the market for licenses clears more frequently than the monopolist sets prices, and that the government sets the quota less frequently than the monopolist sets prices. I later show that this assumption is not really needed, as similar results are obtained when the monopolist is able to adjust prices faster than the rate at which the market for licenses clears.

The model is then solved backwards as usual. First the market clears. Then the monopolist chooses price, taking into account its effect on the license price. Finally, the government chooses the quota, taking into account its effect on the price charged by the monopolist and thus on the license price.

The basic point is that the license price is positive if, and only if, the price charged by the monopolist is lower than the price at which domestic demand equals the quota level. In this case, the license price clears the license market to ensure that only the quota level is sold. As the monopolist's price rises, the license market clearing price falls one for one. Hence, the monopolist cannot raise sales in the domestic market above the quota level by charging a low price.

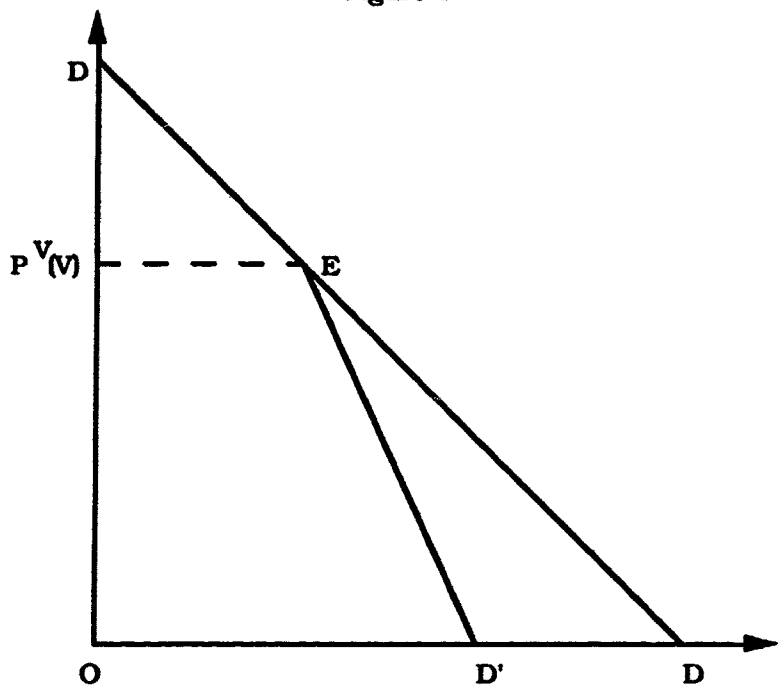
In Figure 1, if DD is his total demand curve in all the markets before the quota is imposed, his demand curve with a quota of V is given by DED'. Note that a kink occurs at $P^V(V)$ where domestic demand equals V and where the license price is zero.

If V is less than the monopoly output, raising the price from $P^V(V)$ is not profitable. Neither is lowering the price profitable if V is close to the monopoly output since the license price rises one for one with a fall in the product price, so that no net sales are generated in the domestic market. In this case, therefore, the

license price is zero, since price is optimally set at $P^V(V)$. Note that if a quota generates no revenue, and restricts consumption that is already too low because of the presence of monopoly power, it must reduce welfare.

If V is very restrictive, however, it may be profitable to price below $P^V(V)$ and allow a positive license price.

Figure 1



Three questions naturally arise. First, how restrictive must the quota be before a license commands a positive price? Second, how does the answer to this question depend on demand conditions? And finally, under what conditions can an auction quota improve welfare over free trade? A simple example with constant demand elasticity sheds some light on these questions.

The following is an example focusing on the roles of demand elasticity and relative market size in determining the effects of quota auctions.

Assume that consumers at home and abroad have identical constant elasticity demand functions given by $P^{-\varepsilon}$. There are N consumers at home and n consumers abroad so that market demand at home is $Q(P) = nP^{-\varepsilon}$ and market demand abroad is $q(P) = nP^{-\varepsilon}$. Assume marginal costs are constant at C.

The smallest quota for which the license price is zero is denoted by V^*. It can be shown that the ratio of the monopoly output, Q^M to V^* is given by:

$$\frac{Q^M}{V^*} = \left[\frac{\varepsilon - 1}{\varepsilon - 1 - (N/n)}\right]^{\varepsilon}. \tag{1}$$

There are a few implications to notice from this expression. First, Q^M always exceeds V^* so that the quota must be set below the free trade level of imports for a license price to be non-zero. Second, if the two markets are of equal size, i.e., n=N, then $[Q^M/V^*] = [(\varepsilon-1)/(\varepsilon-2)]^{\varepsilon}$, and if $\varepsilon>2$, the quota needs to be quite restrictive for the license price to be positive. For example, if $\varepsilon=3$, then the ratio of monopoly output to V^* is 8. Third, for any ε and N, the limit as $n \to \infty$ of $[Q^M/V^*]$ is one. Thus, as the home market becomes small relative to the foreign one, the license price becomes positive when the quota is not very restrictive. This makes sense, since, when the foreign market is large, the costs of attempting to appropriate rents in the home market by raising price above that which is profit maximizing for the foreign market alone are also large. Fourth, for any ε as long as $[\varepsilon-1-(N/n]>0$, $[Q^M/V^*]$ rises as (N/n) rises. As the home market becomes more important, the license price remains zero for longer as the quota falls. This is to be expected as the benefits from attempting to appropriate quota rents by raising price rise. Fifth, if $[\varepsilon-1-(N/n)]<0$, the price of a license is always zero. As $[\varepsilon-1-(N/n)]$ approaches zero from above, $P^V(V) \to \infty$ and $V \to 0$. Thus, the range shrinks to zero where the license is positive, i.e., where $V \leq V^*$.

It can also be shown in our example that welfare can never rise if the foreign elasticity of demand is equal to the home elasticity of demand. But if foreign demand is more elastic, it is possible for welfare to rise when the optimal quota is set. The intuition for these welfare results is that if foreign demand is more elastic than home demand, then raising the price to make the quota bind will cost the monopolist dearly in terms of losing customers in the foreign market. This is especially true if the home market is small relative to the rest of the world. It is possible to construct examples where the optimal policy is a quota below the free trade level of imports.[7]

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[7] Assuming $\varepsilon = 1.1$, $e = 8$, $N/n = .0001$ yields one such example.

2.2 Home monopoly

So far I have argued that with a foreign monopoly there is reason to expect that auctioning quota licenses will not raise revenue. Here I briefly discuss whether the same result occurs when there is a monopoly at home and competition abroad. If the domestic and foreign goods are substitutes and a quota at, or close to, the free trade level is imposed, then the license has a positive price. If the goods are complements, the license has a zero price. In either case, welfare is adversely affected.

The intuition behind these results can be understood by considering what happens with a quota at the free trade level. When the goods are substitutes, an auction quota at the free trade level makes the demand facing the home monopolist less elastic for price increases above the free trade level, but does not alter demand for price decreases. This creates an incentive for the home monopolist to raise the price. By doing so, the monopolist causes an increase in the demand for the foreign good and creates a positive price for import licenses. However, because the foreign supply is competitive, the license revenue comes at the expense of consumer surplus rather than from profit shifting. A quota thus results in a deadweight loss and welfare deterioration.

In contrast, if the goods are complements, the quota makes the demand facing the home monopolists at the free trade price less elastic for price decreases, but leaves it unaffected for price increases. This makes it unprofitable for him to raise or lower his price from the free trade level so that the market for licenses clears when the license price is zero.

2.3 The importance of timing

So far I have assumed that the market for license clears faster than the monopolist can set his price. Thus, the monopolist acts like a Stackelberg leader and takes into account the effect of his actions on the equilibrium price of a license. One might ask whether this time structure is responsible for the results obtained so far. In fact, this is not the case and similar results hold when the market for licenses clears more slowly than the monopolist sets his prices so that the monopolist takes the license price as given.

Consider the model of Section 2.1 with the new timing structure. In the last stage, the firm chooses price P taking as given the value of the license L and the quota level V. Its profits thus depend on how consumer demand is affected, given L and V.

If consumers assume that L is fixed and that any number of licenses will be available at this price, even if P is very low, then consumers are said to behave myopically. In this case, auctioning the licenses will bring in revenue. The equilibrium license price here is the same as the import equivalent specific tariff. The

equilibrium price of a license is zero if $V \geq V^F$, the free trade level, but it is positive if $V < V^F$ and increases as V is reduced. Thus, a license always has a positive price if the quota is set below the free trade level.

If, on the other hand, consumers are non-myopic and realize that the number of licenses is limited to V, they will take the license price as given only when the product price is high; when the product price is low, they know that a black market for licenses will emerge which will raise the effective license price. The demand curve facing the monopolist will be kinked, like the one described in Section 2.1. However, the position of the kink depends on the license price set at the previous level. If the monopolist prices at the kink, the license price set at the previous level is an equilibrium. As before, the monopolist prices at this kink for a number of license prices and quota levels. Thus, there are a number of equilibria with different license prices for a given quota. However, zero remains an equilibrium license price, as long as the quota is not too restrictive. This is because, if the license price were zero, then the monopolist would continue to price at the kink, which is where the license price was set (zero in this case), so that this remains an equilibrium for some quota levels. For more restrictive quotas, the monopolist will choose not to price at the kink when the license price is zero, and the equilibrium price will be positive. However, there is a continuum of such license prices for any quota below the free trade level.

Thus, the result that auction quotas may not raise revenue unless they are quite restrictive re-emerges when the timing of moves is altered and consumers are not myopic. However, the result that license prices are zero unless the quota is very restrictive is less compelling here, as other equilibria also exist where the license price is positive.

3. Making Altruism Pay in Auction Quotas

The previous section argued that with a foreign monopoly, irrespective of whether or not the domestic market can be segmented from the world market, the price of a license is zero unless the quota is very restrictive. In this section, I argue that giving away a portion of the import licenses to the foreign firm is one way of raising revenue from the auctioning of quota licenses. This, in turn, affects the comparison between the optimal policy and free trade, and between auctioning existing quotas and a VER. Both these comparisons are dealt with below. The analysis of this section is based upon Krishna (1990b).

The point that altruism may pay is made in the simplest possible model: that of a foreign monopoly. The idea is that giving some of the licenses away to the foreign producer affects

his pricing decision -- the producer must now consider not only gross profits but also the value of the licenses given to him by the government. Giving away quota licenses makes it more costly for the monopolist to raise his price in order to extract the quota rents from the domestic market. Keeping down the monopolist's price in turn raises the price of the licenses that remain in the hands of the government.

Another way of thinking about the effects of giving away some of the licenses is to note that if the equilibrium price of a license is positive, the quota allows the foreign monopolist to segment effectively the domestic and foreign markets. The price to consumers at home can exceed the price to consumers abroad by the amount of the license price. Since segmentation can only be in this direction, it will be used only if home demand is less elastic than home demand in the rest of the world. This analysis is closely related to that of Jones and Takemori (1989) who make a similar point about tariffs allowing market segmentation. Their model, however, deals with tariffs, and does so in a general equilibrium setting in contrast to the partial equilibrium setting used here.

The results from the previous section indicate that if the government sells all the licenses, it is optimal for the monopolist to raise the product price so much that the license becomes zero. As long as the quota is not very restrictive, the benefit to the monopolist of raising the product price and thereby appropriating the implicit quota rents outweighs any possible gain from market segmentation. However, if the government gives some of the licenses to the monopolist, there is less to be gained by raising price. Since the monopolist possesses some licenses he is able to keep that portion of the quota rents -- this makes it worthwhile for the monopolist to allow a positive license price if it effectively helps to segment the market. Of course, this in only worthwhile if home demand is less elastic than foreign demand.

How does the analysis in this paper relate to recent work on auction design? There is extensive literature on auctions and the form of optimal auction design. The lessons of that literature for the auctioning of quota licenses are nicely summarized in Macmillan (1988). A more detailed survey of auctions is contained in Milgrom (1985). This work is unfortunately not well suited to analyzing the auction of quota licenses. Although the literature deals with both single and multiple object auctions, it makes assumptions on the valuations of bidders that are inappropriate for the purposes of this paper.

Much of the literature on auctions deals with the "private values model," where bidders are certain of their own valuation at the time of bidding, but are uncertain about the valuation of others. This is clearly inappropriate for quota licenses as the value of the licenses depends on who has them.

The literature on the "common value model," where agents do not know their own valuation at the time of bidding, is much more complex than that of the private values model. It derives general results based on restrictions such as "symmetry" and "affiliation." These assumptions are needed to make the model tractable, but they are not natural ones to make in the context of auction quotas.

The assumption of symmetry, that is, identical agents, is not likely to hold. There is a natural asymmetry between bidders for auction quotas. Producers of the product, being quantitatively restricted, will have different incentives for purchasing licenses than agents who do not produce the good, but are dependent on the suppliers of the product. The general models of auction design with common values developed in the literature are not well suited to deal with this asymmetry.

None of the other assumptions either, including the weak one of affiliation on the distribution of valuations themselves, are natural. Affiliation places restrictions on the joint distribution of valuations. However, the valuations of agents and the relationship between these valuations are not exogenous. Since valuations are determined in a secondary market, namely, the market for the product being imported, they must be derived on this basis. No exogenous restrictions on these valuations are appropriate; and restrictions on valuations must be derived from assumptions on the operations of the secondary market.

The analysis of optimal auctions for licenses involves multiple objects, non-private values determined in a secondary market, and asymmetric agents. The problem is a formidable one and likely to be difficult to solve in general. For this reason, a partial approach such as the one taken here has some value.[8] I first examine the base case where the monopolist gets all the licenses. I show that if home demand is more elastic than foreign demand, a license will have a zero price. If the reverse is true, a license has a positive price, and markets are effectively segmented by the quota. I then examine the effect of varying the allocation of licenses and the level of the quota, and run some simulations. The optimal levels of the quota and the share of licenses to the monopolist are calculated so as to maximize a weighted sum of license revenue and consumer surplus. Their sensitivity to parameter values is also calculated. The results indicate that it is possible not only for domestic welfare to rise when such policies are set optimally, but also for the

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[8] The work of Wilson (1979), Bernheim and Whinston (1986), and Maskin and Riley (1987) is probably the most relevant in helping to solve this problem. In Krishna (1990c) and (1990d), I study some models of auctions with endogenous valuations.

monopolists' profits and the rest of the world's welfare to rise. Thus such policies could have no losers.

3.1 The model

As before, I assume that the licenses are sold in a competitive market either to competitive domestic retailers with zero marginal costs of retailing, or directly to consumers. The timing of moves is as follows: first, the government sets the quota, V, and allocates a portion, λ, of the licenses to the monopolist; then the monopolist sets price, P, and decides how many of its licenses to use, u (u cannot exceed λV). The monopolist will choose P and u to maximize total profits, which include license revenue for the given levels of λ and V. Finally, the market for licenses clears.

I first consider the base case where the monopolist receives all the licenses.

3.2 Giving away all the licenses

Before we analyze how the monopolist sets P and u in the base case where he receives all the licenses ($\lambda = 1$), consider what their optimal values would be if the markets were segmented, and no arbitrage were possible. For any value of λ, and for any V below the free trade level V^F, the monopolist will choose to use all of his licenses ($u = \lambda V$), and set price at P(V) where the home market is equal to V. Because all licenses are sold and price is set to clear the market, the license price is zero. Since markets are already segmented, there is no gain in using a positive license price to segment them.

Now turn to the base case where markets are not segmented and $\lambda = 1$. It is useful to consider the cases where $e > \varepsilon$ and $e \leq \varepsilon$ separately, where ε and e denote respectively the home and foreign elasticities of demand.

If the home market demand is less elastic than foreign demand, then P^M, the profit maximizing price for the home market alone, lies above P^F, the free trade price, which in turn lies above P^m, the profit maximizing price for the rest of the world alone. If the opposite holds, these inequalities are reversed.

The first thing to note is that if $e > \varepsilon$ and $\lambda = 1$, the license price is positive for all V. When home demand is less elastic and all licenses are allocated to the monopolist, he acts in a manner similar to a price discriminating monopolist and obtains the profits of such a monopolist by allowing the license price to be

positive. Thus, giving away all the licenses can create a price for them, but as the government has no licenses, it has no revenue.

If $e \leq \varepsilon$ and $\lambda = 1$, the monopolist does not wish to set a higher price in the home market than in the foreign market, and therefore sets prices so that the license price is zero unless V is quite small -- how small depends on the relative sizes of the markets and the difference in the elasticities of demand. It follows from these results and the use of continuity arguments, that the government will obtain revenue from the auction of licenses for λ close to 1 if $e > \varepsilon$, but not if $e \leq \varepsilon$. Hence, only the former case is studied in the following sections.

3.3 Varying the quota and the proportion given to the monopolist

The question now is whether the license price remains positive when $\lambda \neq 1$. If this is so, the government can obtain non-negative revenue by retaining some licenses.

It is clear that auctioning quotas must worsen welfare compared with free trade if the price charged by the monopolist rises, because the gain in license revenue cannot compensate for the loss in consumer surplus in this case. However, if the monopolist's price falls and much of the license revenue accrues to the government, welfare at home may rise above its free trade level. Note that if the price charged by the monopolist falls, consumers in the rest of the world must gain. If the license price is positive, the monopolist can effectively price discriminate. Hence, if λ is high, and $L(\cdot) > 0$, the monopolist's profits could also rise. Therefore, it is possible that only domestic consumers lose. If aggregate welfare rises, these consumers can be compensated for this loss.

The possibility that all parties could gain from such policies can be understood by noting that perfect price discrimination by a monopolist leads to maximization of world welfare. Since quotas allow price discrimination when the license price is positive, they improve world welfare. This gain could then be distributed among the home country, the monopolist, and the rest of the world's consumers through the appropriate allocation of licenses so that all parties benefit.

There are two policy questions that need to be clearly differentiated. First, for a given level of a quota, is auctioning the entire quota better than not auctioning it? To answer this, it is important to be clear about what constitutes the status quo.

It is often claimed that the present system gives the quota license rents to foreigners. If we take this to mean[9] that the status quo is $\lambda = 1$, and if we interpret auctioning all the quotas as $\lambda = 0$, then auctioning is quite attractive when V is close to V^F. To see this, note that license revenue to the government is zero in either case. Hence, we need only look at the price to consumers to determine welfare effects. If $e > \varepsilon$, domestic consumer prices are lower when $\lambda = 0$ than when $\lambda = 1$ as $P(V) < P^M$. If $e < \varepsilon$, and V is close to V^F, the price charged is the same when $\lambda = 1$, and $\lambda = 0$, and equals P(V). Hence, when the status quo is $\lambda = 1$, and V is close to V^F, auctioning existing quotas raises welfare if $e > \varepsilon$, and does not affect welfare if $e < \varepsilon$.

The interpretation of the status quo as $\lambda = 1$ could be argued to be inappropriate on the grounds that licenses are not awarded to the foreign firm. A more reasonable description might be that the monopolist is simply constrained to sell no more than the quota. If the monopolist charges a low price, and demand at this price exceeds the quota, then whoever is lucky enough to get the good effectively gets a license as well, since he or she can resell the good at its market clearing price and reap the implicit license rents. This alternative interpretation of the status quo has $\lambda = 0$. The government does not get any license revenue -- quota rents go to the retailers (domestic or foreign) and domestic consumers who buy the good from the monopolist. Because the monopolist holds no licenses, auctioning off the existing quota does not affect behavior. Auctioning can transfer rents to the government if the license price is positive, but the transfer represents a net increase in welfare only if it comes at the expense of foreign, rather than domestic agents. For this reason, auctioning all existing quotas will never improve welfare if all the goods are allocated to domestic agents under the status quo. It will improve welfare if some of the goods are currently allocated to foreign agents and if the license price is positive, but this requires the quota to be very restrictive.

Auctioning part of the existing quota, however, is actually quite attractive -- when λ is set optimally, welfare weakly exceeds its level when $\lambda = 0$ or 1, and many even exceed its free trade level if the quota is not too restrictive and $e > \varepsilon$. If $e < \varepsilon$, the ability to set λ optimally for a given quota is less valuable, as the monopolist cannot segment the markets, and the quota cannot be Pareto improving.

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[9] $\lambda = 1$ can be the status quo even if no formal licenses exist if, under the quota, the firm can price exports to the restricting country higher than exports to the rest of its markets. This presumes, of course, that the quota is implemented so that the firm has the sole ability to export, i.e., that trans-shipments from other markets are not possible.

The second policy question concerns the optimal levels of λ and V and how they vary with e, ε, N, n, and β. N and n are the number of home and foreign consumers, each having a constant elasticity demand function given by $P^{-\varepsilon}$ and P^{-e}, respectively. Let β be the weight given to license sales revenue in the welfare function -- it can be thought of as an estimate of the cost of raising revenue from alternative sources. $\beta \to \infty$ corresponds to the revenue maximizing case, while $\beta = 1$ corresponds to maximizing the usual welfare function.

I resort to numerical simulations to compare the level of welfare when λ and V are set optimally to welfare under free trade. First, I explore the conditions under which welfare rises from its free trade level. Second, I determine how the welfare maximizing policy varies with β, or how large β has to be to make auction quotas better than free trade.

The main results from the simulations are the following: welfare, when λ and V are set optimally and the license sales revenue is not given extra weight, exceeds welfare under free trade when home and foreign elasticities are substantially different, and the home country is relatively large. This is also the situation in which all parties gain from the optimal pricing.

When license revenue is given greater weight in welfare, i.e., $\beta > 1$, a quota becomes more desirable for revenue reasons and the license price under the optimal policy tends to be positive.

4. Oligopoly

This section summarizes the effects of quota auctions when there is either a foreign or domestic oligopoly. The analysis here is based upon Krishna (1988). One might expect that if there are many firms, and competition among them is strong enough, the prices charged might not rise in response to a quota, so that the price of a license could be positive. In what follows, I assume there is competition in price with differentiated products. This is done both for convenience, and because competition in price is more intense than is competition in quantities.[10]

If there are many foreign firms and a quota is imposed on total imports, each firm will be discouraged from raising its price, since doing so will reduce its own sales and boost those of its competitors. Even in this case, however, I show that licenses receive a zero price unless the quota is quite restrictive. This is because the effect of competition from other firms does not outweigh the incentive to affect strategically the price of a license on the part of a firm.

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[10] See Eaton and Grossman (1986) for a discussion of the role of the strategic variable.

When there are many domestic firms, each one will have less of an incentive to raise the domestic price with a view to making the quota bind on imports, since its competitors will also benefit from its action. I consider both the case when foreign and domestic goods are substitutes for each other, and when they are complements.

4.1 Foreign duopoly

In this section and the next, I argue that even with many foreign firms, each with some market power, a quota on total imports implemented through the sale of licenses will tend to be welfare decreasing. The main results are that auctioning quotas will not raise revenue for the home government unless the quota is set significantly below the free trade level of imports. Slightly restrictive quotas will only raise import prices and therefore reduce welfare from the free trade level. This tends to make quotas, even when set at optimal levels and auctioned off, worse than free trade. However, it is no worse to auction quotas than to impose a VER where quotas are given away to foreign agents other than foreign producers. It is definitely better to auction quotas only if the quota is quite restrictive.

In order to develop some intuition, I first analyze a model of foreign duopoly. For simplicity, assume that the two foreign firms (Firm 1 and Firm 2) are identical, i.e., impose symmetry. Further assume that the goods produced by Firm 1 and Firm 2 are substitutes for each other. Marginal costs of production are assumed to be constant and equal for both firms.

In the absence of any quotas, each firm maximizes its profit, taking its rival's price as given. The first thing to note is that the free trade equilibrium remains the equilibrium when the quota is set at the free trade level. This of course implies that the license price is zero in equilibrium. To see why this occurs, suppose Firm 2 sets its price at its free trade level, P^{2F}. If Firm 1 sets its price below its free trade price P^{1F}, the quota binds, so it cannot increase its sales. Thus, it has no incentive to change its price from P^{1F}. Similarly, Firm 2 has no incentive to change its price from P^{2F}, so that these original prices constitute a Nash equilibrium after the imposition of a quota at the free trade level.

Now consider the effect of reducing the quota very slightly from the free trade level. It is easy to verify that this does not affect the equilibrium. The quota makes demand less elastic for price decreases from the price at which the quota just binds, and does not affect it for price increases. Because of this, it remains optimal to price where the quota just binds. For this reason, licenses still have no value in equilibrium.

As V is reduced further, the sale of licenses raises positive revenue. This occurs, however, only when the quota is quite restrictive and the resulting welfare improvement may be offset

by the loss in consumer surplus. In studying the effects of a VER or quota with foreign duopoly, Helpman and Krugman (1989) show that for a linear example it is never optimal to set a restrictive quota.

The effects of the quota system as described above depend on substitutability between products, overall demand elasticity for the product group, and the number of firms in the market. The following example illustrates the consequences of changes in these parameters.

I use a CES/CED formulation. Demand arises from a utility maximization with the utility function given by:

$$U(S,n) = S^{\alpha} + N \tag{2}$$

where S should be thought of as the services provided by the various products consumed. Also, $S = F(x^1,...x^n)$, where $F(\bullet)$ is a standard, constant returns to scale, production function, and $(x^1,...x^n)$ are the quantities of the n differentiated products consumed. The function $F(\bullet)$ is assumed to take a CES form so that $S = [\Sigma(x^i)^{\tau}]^{(1/\tau)}$ where $\tau \in (-\infty, 1)$. Recall that the elasticity of substitution $\sigma = 1/(1-\tau)$ and $\sigma \in (0,\infty)$. The consumption of the numeraire good is denoted by N in the utility function. This parametrization draws attention to the crucial parameters: the substitutability between goods as given by τ, and the demand elasticity for the aggregate good as captured by α.

We are interested in discovering how restrictive the quota has to be for a license price to become positive. The ratio of the free trade level of imports, V^F, to the largest quota at which the license price is positive, V^*, is:

$$\frac{V^F}{V^*} = \left[\frac{(\sigma(n-1)-n)(\sigma(n-1)+\varepsilon)}{\sigma(n-1)(\sigma(n-1)+\varepsilon-n)}\right]^{-\varepsilon} \tag{3}$$

Note that V^F exceeds V^*, and that as the number of firms, n, or the substitutability between their products, σ, becomes infinite, competition becomes intense and we approach the results of the competitive case, $(V^F/V^*) \to 1$.

As an example, if $\varepsilon = 1.1$, $\sigma = 3$, and $n = 2.2$. This means that $(V^F/V^*) = (1.37)^{1.1}$, so imports must be reduced by about one-quarter from the free trade level in order to make the license price positive.[11]

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[11] Note that if σ is a small relative to n, V^* becomes negative so that any quota gives a zero license price and quotas are always harmful.

If auction quotas do not raise revenue, they must reduce welfare since they further restrict consumption without shifting profits. Since welfare falls as V is reduced from V^F to V^*, and only rises after that, even optimally set auction quotas are unlikely to raise welfare. In fact, for the example developed here, auction quotas can never raise welfare. The basic reason is that the price charged by firms rises as the quota falls. This makes it impossible for the loss in consumer surplus to be outweighed by a gain in revenue.

4.2 Duopoly at home

The previous section considered the effect of the quota system on the price of licenses when there were many foreign firms. This section now examines what happens when there is a foreign competitive supply but market power on the part of home firms. For convenience, we shall consider the case of duopoly.

In Section 2.2, we saw that with a home monopoly and foreign competitive supply, a license has a positive price when the home and foreign goods are substitutes and the quota is close to the free trade level. However, because of the absence of profit-shifting effects and because prices to consumers rise, there is only a deadweight loss from auctioning the licenses. When goods are complements, the license has a zero price. Again, quotas are welfare decreasing. Similar results are obtained when a home firm has competitors who are also unrestricted by a quota and have market power.

Consider a market in which differentiated products are sold. There are two symmetric home firms (Firm 1 and Firm 2), with market power, that are not subject to a quota.[12] Let P^1 and P^2 denote their prices, let P^* be the price of the competitive foreign firms who make a homogeneous product. All firms have identical constant marginal costs of production. Since the foreign firms are competitive, P^* is equal to this marginal cost. The home firms make products that differ from each other and from the goods produced by the foreign firms. In the absence of any quotas, each home firm maximizes its profits by choosing its price, taking its rival's price (and marginal cost) as given.

Consider the effects of a quota on imports at the free trade level when imports and domestic goods are substitutes. As usual, the market for licenses determines their price. This price increases in P^1 and P^2 but decreases in the quota level, V. Raising the price of import substitutes shifts the demand for imports outward, thereby raising the license price. Raising the quota level

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[12] Alternatively, they could be two foreign firms not subject to a quota which is country specific. Examples of such quotas are the VERs on automobiles in 1981 which were aimed at Japan.

shifts the supply of licenses outward, and reduces the license price.

The presence of a quantitative constraint on imports makes the demand facing each domestic firm less elastic for price increases. Each home firm thus has an incentive to raise its price, given the price set by the other firm. In so doing, they raise the equilibrium domestic price and consequently induce an increase in the demand for imports. This in turn creates a positive price for an import license.

The fact that selling licenses raises revenue does not, however, mean that this policy leads to an improvement in welfare. Because the foreign supply is competitive, the quota system does not shift profits, so the gain in revenue comes at the expense of consumer surplus. A quota thus results in a dead-weight loss, despite the positive license price and revenue thereby derived. Note that in this case, quotas above and below the free trade level have welfare-decreasing effects.

Now consider the case where imports and home goods are complements, and the quota is set at the free trade level. The price of a license is implicitly defined, as before, by $L(P^1, P^2, V)$, but this time, $L(\cdot)$ is decreasing in P^1, P^2 and V. The quota binds only if the domestic firms charge a low price. This raises the effective price of the import, but as the goods are complements, the firms lose sales as a result. Hence, there is no incentive for either domestic firm to cut its price. The free trade equilibrium remains an equilibrium and the license price is zero. Quotas close to, but below, the free trade level lead to many possible equilibria, all of which have a license price of zero. Quotas above the free trade level have no effect.

Quotas set below the free trade level tend to reduce welfare because of the absence of any profit-sharing effects. In essence, the loss to consumers outweighs the some of the gains to home producers and the license revenue raised.

4.3 Duopoly with one domestic and one foreign firm

A final case to consider is that of one home and one foreign firm producing substitute goods. Even here, the incentive exists for the firms to appropriate the quota rents by raising their prices. The domestic firm can increase the demand for the foreign product by raising its price. This in turn makes it optimal for the foreign firm to raise its price. Because a quota acts like a capacity constraint on the foreign firm, there is no pure strategy equilibrium in this game. See Krishna (1989a) for a more detailed analysis. The mixed strategy equilibrium involves the domestic and foreign firms in charging prices that allow demand for the foreign firm to exceed the level of the constraint with a non-zero

probability. In this event, a license is valuable and hence its price is positive, even when the quota is set at the free trade level.

When the foreign and domestic goods are complements, the domestic firm has no incentive to make the constraint bind on the foreign firm by charging a low price. A quantitative constraint on the foreign firm thus leads to a pure strategy equilibrium in which prices charged are such that the demand for the foreign product exactly equals the level of the constraint. For this reason, the price of a license is zero, even when the constraint is set below the level of imports under free trade. These ideas are formalized in Krishna (1989b).

The price of a license under such a duopoly is therefore zero when goods are complements, and positive when goods are substitutes. In addition, the license price in the latter case need not depend on the restrictiveness of the quantitative constraint, as the equilibrium prices charged tend to rise when the quota is reduced. Welfare is unlikely to improve in either case.

5. Demand Uncertainty

If demand is uncertain, the price of a license is necessarily positive if at any supply price there is always the possibility that demand will exceed the quota level, resulting in a positive license price. The license is said to have an "option" value if this is the case. The presence of uncertainty does not affect the basic results developed above but can help prevent mixed strategy equilibria as argued below by smoothing out the profit functions.

5.1 Monopoly with uncertain demand

This section considers the effect of demand uncertainty on the optimal pricing of a monopolist and on the price of a license when a quantitative constraint is imposed. Suppose there is a single foreign supplier of a product, who does not know what demand is for certain, but knows what it is on average. He must set his price P before the realization of the random demand, $\tilde{Q}(P,\mu)$. Assume $\tilde{Q}(P,\mu) = Q(P) + \mu$, where μ is a random variable normally distributed with mean zero.

Let the quota level be V. The monopolist chooses P to maximize his expected profits, subject to the constraint that $Q(P) \leq V$. The profit function at a given price is unconstrained if the demand realization is low, and constrained if it is high.

It can be shown that a quantitative constraint at the free trade level tends to raise the monopoly price if the variance in demand is low, but can lower it if the variance is high enough. Moreover, the price of a license will be positive. A license gives its owner the right to purchase one unit at the price set by the

monopolist. For realizations of μ that are low, this right has no value because demand is less than V. For high realizations of μ, however, demand exceeds V, and the market clearing price exceeds the price set by the monopolist so that the license is valuable.

5.2 Duopoly with uncertain demand

Recall the duopoly model of Section 4.3 with one home firm and one foreign firm producing substitute goods. The basic reason why mixed strategies are necessary in that model is that the domestic firm can choose to make the quota bind with certainty on the foreign firm by raising its price high enough. If the foreign firm charges a low price, it is optimal for the domestic firm to make the quota bind, while if the foreign price is high enough, the domestic firm does better by not making the quota bind. This creates a discontinuity in its best response function, which is responsible for the absence of a pure strategy equilibrium.

If demand is uncertain, the domestic firm, in setting its price, can only influence the probability that the constraint will bind on the foreign firm. This probability rises with the price of the domestic firm so there exists no dichotomous decision about making the constraint bind. This smooths out the best response function of the domestic firm and can remove the necessity of using mixed strategies in equilibrium.

Assume there are two firms competing in the domestic market. One is a domestic firm and the other is a foreign one. Let $Q(P, P^*) + \mu$ denote the demand facing the domestic firm and $Q^*(P, P^*) + \mu^*$ the demand facing the foreign firm. P and P^* are their respective prices and μ and μ^* are random variables with zero mean and marginal distributions $f(\mu)$ and $f(\mu^*)$; π and π^* are the firms' expected profit functions. Since the demand for the import exceeds V for high realizations of μ^*, a license has a positive value. However, as V shrinks, the best response functions also change, so that there is no obvious reason to expect the price of a license to rise with reductions in V. If the goods are complements, the effect of a quota on the best response functions is unchanged. However, π is concave in P.

In contrast to the result when demand is certain, a quota may affect equilibrium prices, and since excess demand for imports exists for some realizations of μ^*, licenses are valuable. However, there seems no reason to expect their price to rise as V falls.

6. Conclusion

The main point of this paper is that with imperfectly competitive markets, the endogeneity of prices can result in the value of a license being negligible when a quota is imposed. This occurs when a quota makes it optimal for firms to change prices such that demand does not exceed the level of the quota. In the presence of foreign monopoly power, auctioning quotas is no better than giving them all away to foreign agents other than producers, unless the quota is quite restrictive. In the presence of home monopoly power, auctioning is likely to raise revenue only if home goods are substitutes for imports and not when they are complements. However, the distribution of license revenue between the government and a foreign monopolist can play a role in raising revenue and can even lead to a Pareto improvement over free trade. This occurs when the home demand elasticity is substantially lower than foreign demand elasticity and when the home country is relatively large.

When there is an oligopoly at home or abroad, welfare is likely to fall with the introduction of auction quotas, even when the import licenses bring in revenue. Although uncertainty creates an "option" price for a license, the endogeneity of product prices still limits this price.

Simple models such as those described above help illustrate why auctioning quotas may not raise much revenue in imperfectly competitive markets, but it would also be useful for policy purposes to determine empirically the welfare consequences of such schemes. Recent studies by Venables and Smith (1986), Dixit (1988), and Krugman (1988) on computable partial equilibrium models hold much promise, and work on this front is under way.

More analysis is also needed on the structure of the market for licenses itself. This paper has assumed that the market is competitive. It is worth exploring when this is likely to occur, when there will be incentives for agents to cartelize this market, and who will have the greatest incentive to do so. In Krishna (1990c and1990d), I begin to explore such questions, using models that explicitly take into account the endogeneity of valuations. The work indicates that the details of the auction mechanism and the market structure are also important in determining the outcome of auctioning quota licenses.

The main policy messages from the study of quota auctions with imperfect competition are threefold. First, in predicting the revenue-raising potential of quota license auctions, the market structure and relationship between imports and domestic production need to be carefully taken into account, even if license markets are perfectly competitive. If markets are oligopolistic,

the revenue potential calculated on the basis of competitive models can be quite misleading. Second, the welfare consequences of quota license auctions with imperfectly competitive product markets are quite different from those with competitive markets. The welfare effects depend intricately on the implementation procedure as well as on the market structure and demand conditions. Although welfare may improve if some licenses are auctioned and those remaining are given away, attempts to sell all licenses may well be welfare decreasing. Third, if license markets are not competitive, the welfare and revenue consequences of quota license auctions become even more difficult to predict as the auction scheme itself becomes vital.

In developing policy when markets may be imperfectly competitive, it is important to first identify the main sources of imperfections, and their effects on welfare and revenue of alternative policies. This is likely to be difficult in practice as there are a host of possibly important imperfections. Any analysis on these lines will therefore have to be tailored to the particular conditions of the situation at hand. This paper has outlined the way in which some imperfections enter the analysis. However, much work remains to be done both in terms of the theory, and in applying such ideas to the real world.

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Foreign and Domestic Finance in a Small Open Economy: Peru 1920-1960

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1. Introduction

The role of foreign financial flows in developing economies is continually being debated. Some experts regard foreign portfolio and direct investment as a contributing factor toward development (Vernon, 1971; Sigmund, 1980). In contrast, dissenting scholars have considered foreign loans and multinational corporations (MNCs) as distorting elements in what have been terms "dependent" capital markets (Barnet and Müller, 1974; Evans, 1979; Marichal, 1989). The differing positions in this debate, however, generally rely on incomplete or scant consideration of the concrete historical evidence. This essay contributes to a remedy for this by examining the period 1920-1960 in Peru's financial history.

In the case of Peru, some argue that foreign interests controlled the major economic sectors, as well as the financial system, until the military coup d'état of 1968 supposedly introduced nationalist reforms (Deal, 1976; Malpica, 1977; Albavera, 1981; Ferner, 1982). According to these critics of foreign presence in Peru, this experience exemplifies the adverse

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consequences of foreign penetration. Despite their challenge to what were, until recently, some undisputed assumptions concerning the benefits of foreign investment, the view of these critics of foreign finance is still limited by disregarding concrete historical data on domestic interests competing and collaborating with foreign concerns, and also by implying praise for state interventionist policies (see Pinelo, 1973; Bertram, 1974; Goodsell, 1974).

In the present study I seek to provide, and evaluate, often overlooked historical evidence on the effects of foreign financial flows on the Peruvian domestic financial sector. My assessment will center on the resultant effects of the relationship between foreign and domestic finance in promoting or hindering economic development. My approach considers primarily the interactive nature of foreign and domestic factors in the evolution of Peruvian financial intermediation rather than assuming an a priori condemnation of foreign financial factors. We must weigh the benefits and the costs of foreign finance in Peru against each other instead of expecting only detrimental effects.[11]

I argue that foreign finance was, in balance, limited in its local developmental effects because of (a) the crowing-out of domestic financial resources resulting from foreign financial support to oligopolies and monopolies, (b) the fueling of the state's financial dominance over the domestic private sector by foreign public loans, and (c) the critical impact of the swift entrance and withdrawal of foreign capital according to external financial conditions rather than local financial needs. On the positive side of the balance, I include the contributions of foreign finance to the expansion of the export sector, urban modernization, and the initial process of industrialization. I contend, however, that the relatively positive aspects of foreign finance did not outweigh its detrimental effects on Peruvian development in the period under review.

I first establish the pre-1920 background of the interaction between foreign and domestic finance. I then discuss the initial intervention of the state in domestic financial matters, which was encouraged by the expectation of raising foreign public loans in the 1920s. Next, I analyze foreign participation in domestic financial and political matters during the period on contraction of external public loans in the 1930s. I then evaluate the resulting

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[11] In a methodological sense I basically agree with Ady: "neither in the effects of POI [Private Overseas Investment] upon the balance of payments nor in it effects upon domestic resources is a zero sum game played between capital exporting and recipient countries: i.e., it is not the case that what one side gains represents a parallel loss to the other," (Ady, 1971).

crowding-out effects on domestic financial sources during the successive phases of foreign loans and investment cycles. Finally, I discuss the consequences of regained international credit after 1950.

2. Pre-1920s Foreign Financial Flows

The history of foreign flows to Peru in the twentieth century had a modest beginning because of the country's loss of international credit standing after the War of the Pacific (1879-1883). The nineteenth century public foreign debt had been in default since 1876. In 1890 the debt to British creditors was dramatically cancelled by surrendering national assets as a form of repayment of an approximately outstanding £50 million (Miller, 1976). Nevertheless, no new foreign credit was granted to the state until 1905, and even after that date the external financing of state projects was kept under a low profile until the loan expansion in the 1920s.

Credit to the native private sector and to semi-private public utility companies increased earlier and at a much faster rate than public credit between 1895 and 1913. Crucial to this private form of foreign portfolio investment was the intermediation of local banks collaborating with international financial institutions to form syndicates to float loans inside and outside Peru. Likewise, the oligopolistic funding of some important local firms had either foreign capital participation, foreign management, or both.

Internationally the years between 1870 and 1913 were a boom period for capital exportation (Edelstein, 1982). Unlike in Argentina and Brazil, where public and municipal loans continued to expand throughout the period, in Peru foreign capital expansion after 1890 took the form of portfolio and direct investments in the private sector, linked to exports and urban services. In contrast to the assumption that public foreign debt can be used as a proxy to measure foreign financial cycles, the Peruvian case points to a pattern of alternation between periods of expansion of public loans and periods of increased private portfolio and direct investments, not always closely linked to general international trends. In this sense, Ady's helpful generalization, which describes private foreign investment in Latin America as primarily portfolio investment until 1930 (shifting to primarily direct investment thereafter) (Ady, 1971) should be subtly modified for the Peruvian case.

The major foreign lenders in the pre-1920s period were British, French, and German creditors, in that order in importance. The predominant strategy of foreign lending was that of the British. The French and German creditors differed

significantly from the British with regard to their approach to Peruvian loans. The British merchant-bankers, investors, and their leading representatives emphasized securing the limited loans to the state -- as had been the practice in the nineteenth century -- with pledges of particular state revenues. Likewise, the very secure conditions imposed by British lenders to the Peruvian private sector consisted of consignment or hedge varieties of credit, capital participation, managerial direction, and oligopolistic guarantees. The British also favored participation in local banking institutions (rather than opening their own banking branches) when managerial influence was allowed, and oligopolistic business practices ensured privileged profits.

French financial interests were pressed by their state and diplomatic officials to open wholly French financial institutions in Peru but were ultimately unsuccessful in this regard. the French *haute banque* had to conform to the British lead of joint ventures with local interest took a sharp turn at times. The French claims over the nineteenth-century Peruvian debt were not settled until the 1920s. Loans to the Peruvian state were therefore out of the question in the Paris Bourse. The monopolistic crowding-out of native financial resources was exemplified at its worst by the French venture of the Crédit Foncier Peruvien which attempted to displace native investors from the mortgage credit market.

The German creditors made their successful and competitive appearance in Lima with the granting of the first major loan to the Peruvian government for defense purposes in 1905. Also, the Lima branch of the Deutsch Ueberseeische Bank established in 1903 was the only fully foreign banking institution until 1916. This German Bank introduced modern methods of banking practice, such as individual safe boxes offered to its clients, and provided institutional consignment credit to agro-exporters. Local interests tied to British creditors struggled to avert the penetration and possible dominance of German financial interests.[2] German banking interests were blacklisted and later liquidated during World War I.

A fourth noticeable form of financial inflow after approximately 1900 was the placing of financial assets by North American firms in local banks and among native owners. Among these firms the most important were the Cerro de Pasco Copper Corporation (Guggenheim interests), International Petroleum Co.

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[2] For relevant comments see Dirección General del Banco Alemán Transatlántico (Deutsche Ueberseeische Bank, Berlin), *Memoria y balance* (Barcelona: López Robert, 1911); Frederic Clement-Simon to Ministre des Affaires Etrangères, Lima 18 Jan 1909, AMEF; *Peru Today*, 4, no. 2 (May 1912): 89-92; *El Financista*, 2, no. 111 (9 April 1914): 111.

(Rockefeller interests), W.R. Grace & Co., and the Vanadium Company. Executive of these foreign companies were represented on boards of directors of local financial institutions, trade associations, and the stock market. Striking business agreements and combining interests with local financial personalities were means used for buying-off native properties and legal rights over rich but under capitilized mining sites in the Peruvian highlands. The foreign financial inflow from the United States helped to displace native miner rights for copper mining production and other oligopolies (Low, 1976).

A crucial form of interaction between foreign finance and local private capital was the dependence of native agro-exporters on foreign commercial credit until World War I. Credit for financing the trade and production of agricultural exports was provided for the most part by foreign merchant houses with branches in Peru, but also by merchant-bankers in London and Liverpool. This relationship constituted a strategic source of conflict, as well as of collaboration. Agro-exports was a sensitive area where native capital still kept substantial property rights, Such credit dependence began to change with the export boom of World War I and the foreign credit expansion of the 1920s.

3. Loan Expansion Under Leguía

A dramatic change in the credit conditions of Peru occurred between 1915 and 1920. After experiencing initial trade and financial disruptions caused by the onset of World War I, the occurrence of a significant increase in cotton and sugar prices resulted in windfall profits for native agriculturists.[3] Many agro-exporters were able to repay their debts to foreign merchants, acquire or de-mortgage agricultural properties, and even have enough financial assets remaining to buy stock in banks and other financial institutions.

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[3] A British economic survey stated in 1921: "Up to an including the first year of the War (World War I), Peru was a comparatively poor country, but improved communications consequent on the opening of the Panama Canal, and the demand that then arose for her principal products - copper, sugar, and cotton - inaugurated an era of prosperity unknown since before the war with Chile," F.W. Manners (Commercial Secretary to H.M. Legation, Lima), *Report on the Finance, Industry and Trade of Peru to October 31, 1921.* (London: MHSO, 1922), p. 5, reproduced in United Kingdom, Board of Trade, *Economic Surveys of 1920-1961*, Microfiche (Cambridge: Chadwyck-Healey, 1977).

Coincidentally, British and French capital initiated an exodus because of capital scarcity in war-torn Europe and fears of a post-war international recession. Apart from elite native groups, however, two other agents also disputed who would primarily fill the financial vacuum left by retiring European capital. They were U.S. investors and the Peruvian state under reformist President Augusto B. Leguía.

The Peruvian branch of the Mercantile Bank of the Americas (organized in New York by the Guaranty Trust Co.) opened its business in Lima in 1916 to compete in the financing of crops for exportation and to promote trade with the United States. The Mercantile Bank competed with domestic banks for control over the local market of bills of exchange during World War I. Confronted with the high price of Peruvian currency during World War I, the Mercantile Bank -- in representation of U.S. overseas trade interests -- pressed for a depreciation of the libra exchange rate vis-à-vis the dollar.

The directors of a local bank, the Banco del Perú y Londres, complained about the aggressive policy of the Mercantile Bank, which sought to increase the local value of the dollar in order to have access to more foreign currency. As the main buyer of Latin American products during the war, U.S. trade was suffering from the high exchange rates of some Latin American currencies. In the fall of 1917 the U.S. Department of State and the Federal Reserve Board initiated negotiations for currency "stabilization" with the governments of Argentina, Uruguay, Chile, Bolivia, and Peru. In March 1918 the Department of State had discouraged the manager of the Mercantile Bank in Lima from pursuing any action in reference to the Peruvian exchange rate, that might interfere with the negotiations between the Federal Reserve Board and the Peruvian government. This was part of the growing pressure applied toward the expansion of the paper money supply that the local banks were cautious about facilitating.[4]

Despite the swift initial success of the Mercantile Bank, the local Banco del Perú y Londres was able to oust the U.S. bank from agricultural finance at the cost of increasing its specialization on credit to agriculture, especially to sugar producers, who were vulnerable because of fluctuating sugar prices in the 1920s.

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[4] Banco del Perú y Londres, "Board of Directors Meetings," vol. 3, no. 751, January 1918, p. 293, Banco del Perú y Londres en Liquidación, Superintendencia de Banca y Seguros, Lima (hereafter cited BPLS); Secretary of State to Fred I. Kent (Federal Reserve Board), 28 March 1918; and M.G. McAdoo to Secretary of State, 25 Sept 1918, Department of the Treasury, Box 162, file no. 1, United States National Archives, Washington, DC. (hereafter USNA).

U.S. financial interests were nevertheless able to displace European financial influence in Peru in the financing of Peruvian state loans by the late 1920s. The approval of U.S. loans to the Peruvian state did not, however, have an easy start. Initially, American bankers and financial syndicates contacted and received advice from the U.S. Department of State, which demanded from borrowing Latin American states certain financial reforms before the granting of loans (Mackaman, 1977). These reforms included the establishment of central banks to be modeled after the U.S. Federal Reserve Bank, fiscal reorganization, balanced budgets, and the implementation of sound monetary policies. They also demanded the presence of U.S. advisors in certain key posts in institutions such as customs houses and central banks (Mackaman, 1977; Drake, 1989).

Between 1918 and the first half of 1920 the financial situation of the Peruvian state was satisfactory, thanks to the increase of export duty revenues linked to the high prices of the World War I export boom. In 1920 the foreign public debt amounted to Lp. 2,895,000 (US$13.3 million), including a loan for Lp. 980,587 guaranteed by the salt revenue, and Lp. 600,000 lent to Lima's city council. By June 1920, however, signs of an international recession brought Peruvian export prices down abruptly.[5] As a result, foreign importers had to allow considerable extensions or reductions of between 20% and 50% on credits previously granted to native agriculturists (Manners, 1922; Hill, 1923).

Thanks to a coup d'état staged to remove the opposition to his inauguration, Leguía was governing at this time. Apparently Leguía's forceful move was financed by the Royal Dutch Shell in exchange for the promise of a petroleum concession.[6] Leguía began to find himself in dangerous financial straits by June 1920. Moreover, import and export duties fell from Lp. 2.2 million and Lp. 1.4 million respectively, in June 1921, to Lp. 1.1 million and Lp. 0.4 million in June 1922 (Hill, 1923). Leguía was placed in the difficult position of not being able to pay the salaries of the armed

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[5] F.W. Manners, "Peru, Economic Report: January 1920-February 1921," Lima 26 Feb 1921, F.O. 371, 5610, A2123, 2123, Public Record Office, London (hereafter PRO); Manners, *Report on the Finance of Peru* (1922), op. cit., 5-6.

[6] According to Pinelo, *The Multinational Corporation*, xii, based on a confidential enclosure to the report of the U.S. Trade Commissioner in Lima, Carlton Jackson, to the Bureau of Foreign and Domestic Commerce, 5 Aug 1920, U.S. Department of State, 823.6363/32.

forces and state bureaucracy. Leguía desperately needed foreign credit to avert his overthrow under the eroding financial duress.[7]

In consequence, Leguía took U.S. demands for reforms seriously. For example, the introduction of an income tax was discussed but did not materialize. In 1922 he appointed William W. Cumberland, a State Department economist who had graduated from Princeton (where he had studied under Dr. Kemmerer, the money doctor), as financial advisor to the Peruvian government. Later Cumberland was appointed president of the newly created Banco de Reserva confronting at the time the opposition of the local banks.[8] Despite these measures, U.S. credit was not contracted in 1921 because of the severe terms offered by U.S. bankers (Guaranty Trust and National City Bank), and the complications that surrounded the financial transfer of the Peruvian Junta de Vigilancia's gold funds from New York to London.[9]

Instead, Leguía was able temporarily to weather the storm because of the profit that resulted from the exchange and transfer of the Junta de Vigilancia's funds from New York to London. Furthermore, the first U.S. loan was finally contracted in July 1922 with the Guaranty Trust Co., acting as loan commissioners, and floated in New York by Blyth, Witter & Co. and White, Weld & Co. in the amount of U.S. $2.5 million at 8% interest. The guarantee offered was the future revenue of export and import taxes on petroleum products (Suárez and Tovar, 1967). Additionally, a loan was raised in London in December 1922 by Baring Brothers and J. Henry Schroeder & Co. (represented in Lima by the Anglo South American Bank) for £1.25 million to pay for arrears of governmental salaries and pensions. The guarantee offered was the revenue from internal guano sales administered by the reorganized Cía. Administradora del Guano,

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7 "The dissatisfaction caused by the failure of the Government to pay the civil service and the army during many months was widespread, and the latter especially ready to give ear to the persuasions of the enemies of President Leguía, as many officers with their families were practically starving." Grant Duff to Foreign Office, Lima, 4 Jan 1923, F.O. 371, 8478, Doc. A558/file 558/35, PRO.

8 "The Reminiscences of William Wilson Cumberland," interviews by Wendell H. Link, April-May 1951, typescript, 124-153, Oral History Research Office, Columbia University, New York.

9 "Peruvian Account in the Bank of England," F.O. 371, 5610, file 2408, PRO; Manners, *Report on the Finance of Peru* (1922), op. cit., 8; Confidential reports of U.S. Ambassador to Lima, William Gonzales, 7 April 1921 and 22 May 1921, U.S. Department of State, 823.51, M746, roll #1, USNA.

at the time under British control.[10] In October 1923 another loan for consolidation of previous debts was floated in London by the Westminster Bank and Schroeder & Co. in the amount of £10 million.[11] Ostensibly Leguía was playing U.S. and British financial interests against each other and was following the same strategy taken with regard to U.S. and British petroleum interests (Pinelo, 1973).

Subsequent U.S. loans included: a sanitation loan signed in October 1924 for $7 million to contract for the works of a U.S. concern named Foundation Company, formed by the syndicate composed of Morgan & Co., Chase Manhattan Bank and the Third National Bank; the Petroleum Loan of 1925 for $7.5 million; a second sanitation loan in 1926; and a loan for $30 million (Gold Bonds) in August 1926 which was guaranteed by several fiscal rents. In each of the aforementioned loans the Guaranty Trust Co. acted as commissioner, and Blyth, Witter & Co. and White, Weld & Co. brokered the loans in New York. Additionally, a loan for the purchase of submarines for the Peruvian navy was contracted with the U.S. Electric Boat Co. in 1926, and the Tobacco loan of 1927 for $15 million was arranged with a U.S. syndicate composed of J. & W. Seligman & Co., the National City Bank, W.H. Rollins & Co. and others. Seligman also participated in the 1927 loan for the port of Callao.

By now Leguía, through his diplomatic approach, had come closer to the United States, as evidenced by the American President having consented to arbitrate in the territorial dispute between Chile and Peru.[12] Financial difficulties continued for Leguía, however, owing to a pattern of recklessness in debt management. A British diplomat observed that:

> "As it happens with many other countries, the last course the Peruvian government are willing to adopt is retrenchment; on the contrary they continue to pass measures involving additional expenditure whether the necessary funds are available or not, so that with insufficient revenues coming in, it resolves itself into a scramble as to who shall get possession of the small sums trickling into the Treasury. Notwithstanding these happy-go-lucky methods, it seems that sooner or

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[10] Grant Duff to F.O., Lima 4 Jan 1923, F.O. 371, 8478, A617/558/36, PRO; Suárez and Tovar, *Deuda pública externa*, appendix x.

[11] New Loan for Peruvian Government, London 22 Oct 1923. F.O. 371, 8478, A6287/956, PRO.

[12] J.P. Trant to Foreign Office, Lima 26 Aug 1923, F.O. 371, 8478, A5807/558/35, PRO

> later debts are liquidated, and when the turn of the tide in trade produces temporary prosperity enabling the republic to secure credit abroad, she continues her onward march and marks a further stage in development."[13]

The dangers of the Peruvian loan practice were seriously increased as a result of a major breakthrough in the U.S. policy toward Peruvian public debt in December 1927. At this date a loan for $100 million, at a discounted value of 86% and at 6% interest, was granted by a group of New York bankers headed by J. & W. Seligman and the National City Bank without the backing of pledges of specific revenues (as had been the practice with British and U.S. loan granting in the past), but rather, against the general credit of the country. The loan, the first series of the Empréstito Nacional Peruano, was to be applied to the conversion (refinancing) of all the previous and outstanding foreign issues (excluding the 1922 Guano loan), the stabilization of exchange, the establishment of an agricultural bank, and public works.[14] As in the case of the 1927 Tobacco loan, the Peruvian institution of judicial deposits (Caja de Depósitos y Consignaciones) was in charge of providing the payments to the Empréstito loan. A second series of the Empréstito was floated in 1928 in the amount of $25 million and £2 million. A Lima municipal loan was also contracted in 1928 for $3 million with the U.S. firms E.H. Rollins & Sons and the Grace National Bank.

Leguía used the increased supply of foreign credit for essentially infrastructural works which, however, opened wide opportunities for the rise in graft, a serious but "invisible" problem in Latin American debt issues. Foreign observers doubted both the moral integrity of Leguía's officers and family members, and the soundness of Leguía's financial judgement.[15]

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[13] Herbert Harvey, "Peru: Annual Report, 1924," Lima July 1925, F.O. 371,10632,A2304/2304/35, PRO.

[14] Lord H. Hervey to Foreign Office, Lima 21 Dec 1927, F.O. 371, 12787, A470/127/35, PRO; Mackaman, "United States Loan Policy," 520-521.

[15] "The whole presidential family and the Cabinet are feathering their own nests at the expense of the country ... there is not an honest man among them," Bentick to Foreign Office, Lima 30 April 1929, F.O.. 371, 13507, A3600/2406/36, PRO. On Leguía's favorite son, Juan, it was reported that he was "notorious for violence, drunkenness, brawling, etc. ... [obtained] commission of recent loans ... [and] holds many contracts and concessions from Government," Darrell Wilson, "Leading Personalities in Peru," Lima 24 Feb 1937, F.O. 371, 17555, A2627/2627/35, PRO. "Graft was rampant," Cumberland, "Reminiscences," p. 125; [Leguía]

Business results of Leguía's private affairs in cotton financing and trade attested to Leguía's flawed estimations on cotton and sugar prices in the early 1920s.[16] Moreover, it is doubtful that his public works program achieved high levels of efficiency because of the hasty nature of many projects. Nevertheless, the huge increase in roads for motor vehicles, improved sanitation, urbanization, and irrigation works during his presidency meant a partial developmental use of foreign public credit in Peru (Fishlow, 1985).

The most negative effects of foreign credit in Peru in the 1920s were, however, those that resulted from the expansion of foreign loans that bolstered state interventionism. Thus, the road for unsound financial and monetary policies was prepared. Monopolies of ridiculous proportions were established. A match monopoly in February 1926 provided the government with £200,000 annually in exchange for a twenty-year concession to the Swedish Match Company (Svenska Tandiske Aktiebolaget, Stockholm) to import matches from Europe. The monopoly implied the closing down of the two local match factories.[17] Importation of matches from elsewhere was prohibited. The use of automatic lighters by individuals was allowed only by special licenses. The importation of cars with fixtures for lighters was forbidden (Trant, 1927).

Industrial monopolies granted by the state to foreign and native concerns multiplied in the late 1920s. Exclusive rights for the manufacture of specific products, during periods of up to ten years, resulted in higher tariffs and state revenues, and limited industrial promotion. For example, a Briton, Arthur B. Wells, was given an official monopoly for the production of sewing thread in October 1926.[18] A list of sixty-four industrial monopolies and concessions during the Leguía administration were granted as follows: two in 1920, six in 1924, six in 1926,

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"was one of the biggest simpletons in finance whom I have ever known," ibid., p. 129.

[16] "This is a very bad case. President Leguía gambled in cotton futures with the firms money," British diplomatic comments in "Claim of Messrs. Kearsley & Cunningham against Mr. A.B. Leguía," 8 Aug 1928, F.O. 371, 13508, A5418/4687/35, PRO.

[17] Lord Harvey, "Peru: Annual Report, 1925," F.O. 371, 11160, A2480/2480/35, PRO. An agreement between the U.S. International Match Corporation, with interests in the two local match factories closing down, and the Swedish Match Co., also made the monopoly possible.

[18] Harvey to Foreign Office, Lima 2 Nov 1926, F.O. 371, 11160,A6417/6417/35, PRO.

twenty-two in 1927, fourteen in 1928, eight in 1929, and six in 1930 (Wilson, 1934). In consequence, there is a correlation between the rise in the number of monopolies granted by the state and the increase in the foreign public debt since 1926-1927.

The state's agreements with foreign interests during times of increased indebtedness also included one in 1926 with the Cerro de Pasco Corporation for the advanced payment of Lp. 120,000 for export duties on minerals and metals, and another with a British subject, H.V. Holden, former negotiator (together with the Geldmeister concern) of a Rothschild's loan to the government which did not materialize, for the monopoly on the sale of gasoline in Peru.[19]

In the 1920s, despite a fairly stable monetary policy imposed by U.S. creditors, the overspecialization of the local banking system on short-term agricultural credit proved disastrous. The Banco de Reserva had a policy of rediscounting financial instruments of banks heavily involved in commercial credit to planters. Leguía could not correct this easily because of his commitment to agricultural interests. Ultimately in 1929-1930 the domestic Banco del Perú y Londres and the Leguía government experienced bitter disagreement about financial policy and monetary matters. American financial advisors suggested that the Banco de Reserva raise its interest rate and restrict credit in order to stabilize the declining exchange rate and control inflation. The Banco del Perú y Londres opposed any increase in interest rates or the restriction of credit since these measures brought liquidity strains to the already troubled institution.[20] With the hope of obtaining government protection against bankruptcy, the Banco del Perú y Londres had become a heavy creditor of the state. This caused concern among American creditors, who were alarmed by the increase in the local floating debt of the Peruvian government.

According to a diplomatic report, however, by September 1928 the local banks had restrained their credit to the state because of the prevailing adverse financial policies and conditions pressed for by the Banco de Reserva.[21] Agricultural

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[19] Lord Harvey, "Annual Report, 1926," F.O. 371, 12019, A2497/2497/35, PRO.

[20] Banco del Perú y Londres, "Board of Directors," vol. 16, no. 1734, Feb 1929, p. 112; no. 1825, 21 Nov 1929, p. 70, BPLS.

[21] "A large part of the floating debt is in the form of short term notes held by the banks, construction companies etc., and ... its substantial increase apparently restrained only by the reluctance of the local banks themselves, continues to be a source of concern to the Fiscal Agents handling the Peruvian National loans (J. W. Seligman & Co. and the National City Bank of New

creditors who hoped for a loosening of local credit conditions were behind complaints voiced by the Banco del Perú y Londres. In November 1929 interest rates jumped from 8% to 10%. Time was running out for the Banco del Perú y Londres. The fall of Leguía in 1930 finally removed the bank's last weak defense against bankruptcy. Embittered and witnessing the loss of internal support, Leguía criticized Seligman & Co. in December 1929 because "... the fiscal agents (Seligman & Co.) had been prepared to see the whole country go to smash ... and showed a complete lack of desire to be helpful."[22]

After the fall of Leguía, foreign capital continued to exert an important influence. After 1930, mineral and petroleum concessions were to prove crucial in the relationship between foreign capital and the state. In this way local financial and monetary policies were to be increasingly affected by the expanding relationship between the state and foreign financial flows.

4. Foreign Finance during the 1930s

Despite the financial crash of 1929-1932, a politically powerful lobby of agro-exporters, which had turned against Leguía in the crucial year 1930, was able to retain certain influence over the state in terms of financial policy. The financial program established by the emergency government in the early 1930s allowed many agro-exporters to survive. It has been argued that the avoidance of a complete collapse of the Peruvian agro-industry through a swift adaptation to cotton rather than sugar production with the financial support of the state might have been one factor of primary importance in Peru's economic recovery in the 1930s. The departure from the gold standard, the introduction of exchange controls, and the supply of "controlled" credit to cotton producers aided the trend in crop substitution. Significantly, several finance ministers and high officials of the Banco de Reserva faithfully represented the agro-exporting interests during this period.

The second important factor in Peruvian recovery was the suspension of the servicing and repayment of foreign loans in 1931, and the replacement of foreign public credit by mechanisms of internal credit. This restructuring of the public credit was

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York)," U.S.vice consul to Secretary of State, 8 Nov 1928, U.S. Department of the Treasury, Box 162, file no. 2, USNA.

[22] Mayer to Secretary of State, 26 December 1929, U.S. Department of State, 823.516/23, Microcopy 746, roll no. 22, USNA.

aided by the local banks and especially by the most important among them, the Banco Italiano, which had excess deposits for allocation. The purchase of internal debt bonds by local banks proved helpful to the state in meeting its military, road building, and current expenses. Foreign creditors observed these internal developments with remarkable patience.

The strategy followed by foreign financial interests in Peru during the years of depression was threefold. In the first place, foreign creditors were cautious on the delicate issue of repayment of foreign loans, waiting until the Peruvian economy recovered. Secondly, there was a consolidation and expansion of already existing, as well as an introduction of new, monopolies and oligopolies. Thirdly, the foreign financial interests tried to stimulate the import of machinery to supply a budding though costly import-substitution industrialization.

During the most difficult moments of the depression in Peru, foreign capital opted for political stability to avoid undesirable effects on their Peruvian concerns. Thus, loan repayments were not urgently demanded. Instead, foreign interests opted for special arrangements with the Peruvian state. In 1930 the Canada-based petroleum multinational interests, the International Petroleum Company (IPC), was anxious to secure a monopoly for the sale of petroleum in Peru. Political turmoil, however, prevented the closing of the deal with the government. President Luis Sánchez Cerro was in desperate need of funds to pay the army, the navy, and the police. Consequently, the IPC lent the government U.S.$1.5 million in December 1930. Monopoly concessions were soon granted to the IPC (Pinelo, 1973).[23]

On the other hand, the U.S. Cerro de Pasco Corporation (CPC) encountered considerable business and labor difficulties. The CPC relied on the armed forces under the orders of Sánchez Cerro to suppress, what was termed at the time, a communist insurrection in Morococha. Thus, the insistence of foreign interests on political stability contributed to the consolidation of the authoritarian regimes of Sánchez Cerro and his successor, General Oscar R. Benavides.

Some foreign oligopolistic interests like the CPC experienced difficult financial times in Peru during the depression years. The Liverpool based merchant house Graham Rowe had invested considerable sums provided by the Martins Bank to lend especially to agricultural properties. Like the Banco del Perú y Londres, which had overspecialized in agricultural credit, Graham Rowe was not able to repay its creditor bank and was therefore forced to enter into liquidation in October 1931.[24]

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[23] F.O. 371, 1482, A8407/532/35, PRO

[24] Dalton to Foreign Office, Lima 16 Oct 1931, F.O. 371, 15112/A6182/6110/35, PRO.

But in another example, the National City Bank advanced $600,000 in May 1932 and was able to keep alive the Gildemeister's sugar estate Casa Grande, a sugar complex that had the largest sugarcane crushing mill in the world and in which German interests had been involved.[25]

Considering the rather bleak prospects for foreign business in Peru some sober foreign observers argued that the resumption of payments of principal and interest on foreign loans was not possible until international market prices of Peruvian commodities improved, and until political stability allowed a reduction in government expenditures.[26] According to Table 1, from a total foreign debt of $105 million at 6% interest, Peruvians owed approximately $18 per person in 1933 among an estimated population of six million people. Additionally, the total domestic debt (funded and floating) amounted to $44 million and continued to increase thereafter.

A 1934 article in *The Times* of London argued that payments to service the debt were dependent upon the demand for Peruvian primary products abroad. The article speculated that, although Peru had made steps towards economic recovery by 1933, and the confidence in the government of President Benavides was on the rise, foreign debt payments would continue in abeyance until the more developed countries organized their economies to bring the demand for Peruvian products back to normal.[27]

J. Henry Schroeder & Co., representing the creditors of the 1922 Guano Loan, complained, however, in December 1933, that the Peruvian government had used the proceeds of the guano sales under the administration of the Guano Company to purchase arms and aircraft from the United States and Japan.[28] British creditors remained sternly opposed to the Guano Loan being treated in the same manner as the U.S. loans by the Peruvian government. These creditors proposed that His Majesty's Government should condemn any move in that direction and

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[25] Hobson to Foreign Office, Lima 9 May 1932, F.O. 371, 15852, A3713/5/35, PRO.

[26] Sir R. Lindsay to Foreign Office, Washington, 16 December 1931, quoting the *Special Bulletin on Securities in Default of the Institute of International Finance*, no. 48 (1931), in F.O. 371, 15110, A5959/210/35, PRO.

[27] Extract from *The Times*, 6 Feb 1934 in "Peru: Foreign Debt Prospects," F.O. 371, 17552, A1250/282/35, PRO.

[28] Letter by J. Henry Schröder & Co., 15 March 1934, F.O. 317, 17552, A2227/169/35; Wilson to Foreign Office, Lima 3 March 1934, A2628/169/35; A4673/169/35, PRO.

Table 1
Peruvian Public Debt, 1876-1966*
(millions of U.S. dollars)

Year	External Debt							Internal Debt		
					Types of creditors**					
	Pledged on revenues	General Credit	Total	Interest %	% gov	% pri	% int	Funded	Floating	Total
1876	180		180	5.5		100				
1889	250		250	6		100				38
1890	15		15	6		100				38
1920	13		13	6		100				26
1925	25		25	8		100				30
1929		88	88	6		100				36
1933		105	105	6		100		15	29	44
1937		119	119	6		100		18	40	58
1945/48		167	167	6		100		38	99	137
1950		113	113	6.5}				84	11	95
1954		95	95	6.5}	31	48	21	68	48	109
1960		162	162	6.5}						
1966		579	579	6.5}						

* Includes interest in arrears.
** gov = government agencies; pri = private; int = international banks and organizations.

Sources: Corporation of Foreign Bondholders, *Annual Reports* (London, 1873-1886); U.K. Department of Overseas Trade, *Reports* (London, 1922-1955); Rómulo Ferrero, *La Política fiscal y la economía nacional* (Lima, 1946); G. Suárez and M. Tovar, *Deuda pública externa, 1920-1966* (Lima, 1967); Gianfranco Bardella, *Un siglo en la vida económica del Perú* (Lima, 1989).

should disallow any trade agreement without the due consideration of British bondholders' rights.[29] Likewise, in 1935 the British holders of the 1924 Centenary Loan for 5 million soles protested against the unilateral reduction from 8% to 6% in the interest rate paid to them.[30]

U.S. creditors took a different stand from that of the British. After the American congressional investigations regarding foreign loans in the early 1930s, the mood of foreign creditors was one of resigned patience. After visiting Peru in January 1935, J. Rafael Oreamuno, a Costa Rican by birth and a

[29] G.W. Dawes & Co. to Foreign Office, 7 Feb 1935, F.O. 371, 18721, A1214/192/35, PRO.

[30] Forbes to Foreign Office, Lima 10 Sept 1935, F.O. 371, 18722, A8700/192/35, PRO.

representative of the U.S. holders of Peruvian bonds, believed that the time for serious discussions on the debt repayment had not yet arrived.[31] In the meantime, the Peruvian government had managed to allocate two million soles for debt service and two million more for redemption of its public debt. Oreamuno was of the opinion that if left alone for the next two years, Peru would be in a better economic situation to offer a better debt arrangement.

In 1937 Oreamuno believed the time had come for Peru to pay in full what it owed.[32] The Peruvian government, however, continued to allocate only the four million soles mentioned above, following the example of Chile. The amount was unsatisfactory to U.S. creditors but, according to Oreamuno, constituted at least an official recognition of the debt by the 1936 Peruvian budget. Consequently, the June 1937 report of the U.S. Securities and Exchange Commission did not favor the application of sanctions on Peru to enforce repayment.[33]

In November 1935, the Chairman of the British Council of Foreign Bondholders proposed a negotiated settlement of the British debt to the Peruvian Minister of Finance, instead of accepting the unilateral actions on the part of the Peruvian government. According to British diplomats in Peru, the two most important obstacles to the formation of a surplus in Peruvian fiscal finances that could be assigned to the foreign debt service were: (a) the extensive development program launched by the Benavides government to revitalize the economy, and (b) the demands of deputies in the Peruvian Congress to divert funds to their constituencies for even banal and decorative purposes. Additionally, agro-export interests continued to compete with foreign interests in the arena of financial and monetary policies. Thus, in 1937, both Oreamuno and the British Ambassador in Lima had doubts about the sincerity of the Peruvian government's willingness to pay.[34]

Difficulties in resuming the foreign debt payment continued until 1951 with approximately the same characteristics as described previously above. The major change from the viewpoint of foreign financial interests was the encouragement of foreign imports of machinery for the local, protected industries. In 1938, machinery, tools, and metal goods accounted for 40% of the value

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[31] Forbes to Foreign Office, Lima 25 Jan 1935, F.O. 371, 18721, A1703/192/35, PRO.

[32] F.O. 371, 20644, A1598/908/35, PRO.

[33] Sir R. Lindsay to Foreign Office, Washington, 11 June 1937, F.O. 371, 20644, A4468/908/35, PRO.

[34] Forbes to Foreign Office, Lima 12 Jan 1935, F.O. 371, 20644, A908/908/35, PRO.

of all Peruvian imports.[35] The other important items of importation eroding the Peruvian balance of trade were food products such as wheat, rice, and dairy products that accounted for approximately 40% to 50% of domestic local consumption since the mid-1920s when urban centers expanded considerably (Trant, 1927).

The selective protectionist legislation, import quotas, and foreign exchange controls went hand in hand. These measures gradually imposed during the regimes of Presidents Manuel Prado and Alberto Bustamante benefited the interests of industrialists and their allies among the foreign importers.

The link between credit and foreign imports had been established since the beginning of the century. In 1933, the British Ambassador noted that on the sugar estates of anglophile agro-exporter Antero Aspíllaga, the British machinery that had been in use in previous decades was not being replaced by new British imports, owing to the lack of trade credit. Instead, new German technical devices that were procured with credit provided by German importers were being introduced.[36] According to official statistics, the Peruvian balance of trade had suffered a considerable decline as a result of a rapid rise in imports (machinery, chemical products, and food imports) between 1938 and 1945 (Parró, 1945; Ferrero, 1946).

Certainly a local banking institution that benefited from this change in the direction of foreign trade was the Banco Italiano, which relied on U.S., Swiss, and Italian capital support. Foreign banking institutions preferred to support the leading local institution of an already oligopolized financial sector. The liquidation of the Banco del Perú y Londres left several U.S. creditors of this bank with considerable financial claims. Among the major creditors were the National City Bank, W.R. Grace & Co., and M. Samuel. In contrast, the support to the Italian bank, offered considerable advantages.[37]

The Italian bank, unlike the Banco del Perú y Londres, had oriented its loan granting to Lima's e· ρanding urban and service markets that were in need of credit in the 1920s. The Italian owners of factories and commercial establishments were the main clients of the Italian bank. The productive sector supplying the internal market resumed its growth during the recovery years of the 1930s. The Italian bank became the most solid institution in the Peruvian banking system. Local savings and deposits flocked to the Italian bank, which also pursued a conservative

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[35] *Peru: Review of Commercial Conditions* (London, 1944), 6, in United Kingdom, Board of Trade, *Economic Surveys*.

[36] F.O. 371, 16597, A8605/66741/35, PRO.

[37] Bentick to Foreign Office, Lima 14 May 1931, F.O. 371, 15110, A3645/210/35, PRO.

loan policy. The bank also acted as the agent for the Guaranty Trust Co. of New York in the 1920s.[38]

The fascist political sympathies of some managers of the Banco Italiano, especially its head, Gino Salocchi, a close friend of President Benavides, were instrumental in providing commercial credit to the government for the purchase of Italian military equipment in the 1930s (Cicarelli, 1990). Despite these fascist connections, Swiss, French, and U.S. capital continued to prefer the Banco Italiano rather than invest in branches of foreign banks that were not able to compete in the Peruvian banking structure. Additionally, the Banco Italiano changed its name to Banco de Crédito in 1939 to avoid political persecution during war time, and was thus, able to continue its successful business.

The Banco Italiano's support to foreign oligopolies and monopolies was substantial. The EE.EE.AA., the huge electrical concern, which had been restructured in the 1910s and again in the 1920s with participation of British, French, and Swiss capital, was closely tied to the Banco Italiano in the 1920s and 1930s. Other major corporations, like the CPC, were good clients of the bank. Most importantly, the process of concentration in Lima of the local industry depended on the financial and credit backing of the Banco Italiano. Only in the 1950s, with the establishment of new banks with modern banking methods (Banco Continental) and U.S. financial participation, was there to be a greater challenge to the Banco Italiano's dominance over the local banking business.

5. Crowding-out Effects

In an economy like that of Peru, delicately balanced and exposed to volatile international fluctuations, foreign capital strove to control the most profitable activities. Native financial resources were therefore removed from several of the most profitable businesses and forced into areas of relatively high risk or to areas of no interest to foreigners. The initial blatant displacement of native financial interests as in the cases of the British-controlled Peruvian Corporation, Cerro de Pasco, IPC, or Crédit Foncier, gave way to a subtler strategy of joint ventures, especially in the highly concentrated industrial sector. Also, the government's arrangements with foreign interests could sanction legal monopolies. In the end it was the native private sector that was squeezed between foreign interests and an interventionist state.

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38 *Report on the Finance, Industry and Trade of Peru* (London: 1922), 6, in United Kingdom, Board of Trade.

The first significant examples of the crowding-out effects are found in the settlement of the nineteenth century foreign debt. The Peruvian Corporation obtained concessions from the state railway that placed them in almost monopolistic control of the railway system in Peru. The fact that the Peruvian Corporation provided its shareholders with only modest profits and perhaps losses does not exclude the fact that it actually crowded out local or other foreign resources from access to many economic opportunities (Miller, 1976a).

The Cerro de Pasco Corporation started its activities in Peru by secretly buying land in the Morococha-Cerro de Pasco region of the central sierra in the early 1900s. Guggenheim interests guaranteed substantial financial support. A significant group of those Peruvian miners who sold their properties seemed to have made a rational decision, because they received considerable payments that they later re-invested in other sectors (Low, 1976). Likewise, the Empresa Socavonera Cerro de Pasco, a native concern with financial connections in Lima, managed to strike a favorable deal by obtaining stock shares in the CPC in exchange or its draining rights in Cerro de Pasco. In 1902 the Empresa Socavonera had secured from the Peruvian government an official contract with exclusive rights to the necessary drainage work in the area.

The Banco del Perú y Londres owned a substantial number of the Socavonera's shares, and these were accepted as first class collateral by the bank's clients. Powerful officers in the Banco del Perú y Londres were among the Socavonera's directors, managers, and shareholders. At the same time, British interests (the Peruvian Corporation) were also in the dispute with the U.S. company. Financial and technical problems assailed the Socavonera, although it triumphed in it legal disputes with the Cerro Corporation. Foreign pressure resulting from a settlement between British and U.S. investors in matters of railway use, and the willingness of the Banco del Perú y Londres to cash in its participation in the Socavonera, resulted in the selling out of the native Socavonera to U.S. interests. The final arrangement took approximately ten years (1904-1914) of negotiations.[39]

In addition, in 1926, the Cerro de Pasco Corporation suddenly became the owner of a sizable native cattle breeding concern, the Sociedad Ganadera Junin, whose shares were among the most profitable on the Lima Exchange. Litigation with the local owners of the Sociedad Ganadera for damage claims, due to pollution in the mining area adjacent to the cattle lands,

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[39] Banco de Perú y Londres, "Directorio," vol. 3, no. 385, 10 Oct 1904, pp. 220-221, BPLS; *Gaceta Commercial*, vol 6, no. 127 (1906): 1213; Ernesto Yepes, *Perú 1820-1920: un siglo de desarrollo capitalista* (Lim: IEP, 1972), 150-151, 178.

concluded in the sale of the property for Lp. 342,000 to the U.S. company (Trant, 1927).

The French attempts to establish a dominant financial presence in Peru constituted a clear example of crowding-out effects. The participation of the Société Générale and the Banque de Paris in the capital stock of the Banco del Perú y Londres, and the partnership of these three institutions in a joint mortgage venture in 1913, the Crédit Foncier Peruvien, were sought by French financial investors in order to gain local representation and a better position from which to press French claims. The high profits of the Banco del Perú y Londres were a secondary reason for the French institutions' participation in the local bank's activities. When a stricter defense of their interests in Peru was needed, these Parisian banks attempted to gain control over the Banco del Perú y Londres. The French attempts conflicted with the existing British and local management of the institution. The conflict became clear to the local directors in 1913 when news from Paris alerted them to measures taken by the Société Générale and the Banque de Paris to monopolize the European transactions of the Banco del Perú y Londres (thus conflicting with the London partners' finance commissions), and to dominate vertically the Crédit Foncier Peruvien. In a meeting of the Banco del Perú y Londres' Board of Directors, it was stated that the real purpose for these French actions was to force:

> ...us to exert our influence over the public and government in Peru to acquire the Muelle y Dársena (del Callao) which the Société Générale was seeking to sell for some time now. It was recalled that the (Perú y Londres) bank had assisted the Société Générale in every way it could and that it was willing to do the same again, but present circumstances make it impossible from every point of view to bring about the successful conclusion of the matter.[40]

At first, the Société Générale and the Banque de Paris found that the Banco del Perú y Londres offered the advantage of a foreign presence and thus, was more reliable and trustworthy. In an accurate observation on the Banco del Perú y Londres' directive body, but with an obvious underestimation of the importance of the local savings that composed the bulk of the

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[40] Banco Perú y Londres, "Directorio," vol. 3, no. 929, 9 June 1913, p. 27, BPLS. The Société Générale was pressing to sell its interests in the Callao wharf to the Peruvian government at a high price, but President Billinghurst was strongly opposed to the purchase.

local bank's liabilities, a French diplomat informed Paris: "The Council of that institution is almost entirely composed of foreigners, and the funds for its establishment and development have been provided by foreign savings."[41] The Parisian banks' decision to participate in the Perú y Londres finally swept away any hope for the establishment of an entirely French bank in Peru:

> We will never have a completely French bank in Lima...because the Bank Peru y Londres is supported by the French banks of the Rue Boudreau, by the Société Générale, the Banque de Paris et des Pay Bas and the Comptoir Nationale. These groups will not compete with each other by creating a rival bank. Neither is it probable that other French groups will choose the option of trying to replace them.[42]

As soon as the Banco del Perú y Londres' shares were quoted in Paris in 1907, French participation in the Banco del Perú y Londres' Board of Directors increased from one representative (Raoul de Saint Seine, manager of the Muelle y Dársena) to two, when Octave Besançon, head of the French merchant house Harth & Co. in Lima, was appointed director . The line of action followed by the Parisian banks and supported by French diplomats consisted thereafter of efforts to increase French representation and influence in the Banco del Perú y Londres' Board of Directors. In a 1909 letter to the French Minister of Finance, the French Minister of Foreign Affairs recommended that he personally alert the manager of the Banco del Perú y Londres to the French government's desire to see French capitalists better represented in the Banco del Perú y Londres.[43] Frederic C. Simon, French diplomatic representative in Lima, had informed M. Pichon, Minister of Foreign Affairs in Paris, about the inconvenience of having M. Stubel, a German employee of the Harth & Co., replace former director Besançon because of the dangerous German business competition in Peru. Instead, Simon proposed Henry Grellaud, a Frenchman, second in command after Stubel in Harth & Co. It was agreed that Grellaud be nominated in view of such strong pressure.

French pressure was also exerted to form a committee of the Banco del Perú y Londres in Paris with general counseling powers. For Simon, however, there could be no compensation for

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41 Simon to Pichon, 5 July 1909, B31 345, AMEF.

42 Ibid.

43 Pichon to Ministre des Finances, 12 Nov 1909, B31 345, AMEF.

reducing the French representation on the far more powerful Board of Directors. Moreover, the same French diplomat saw a need to raise the number of French representatives to three if major financial transactions with French participation were successful in Paris and London, "to provide the French presence in this country an instrument of action in exact proportion to the resources that we supply to the Peruvian finance."[44]

Eventually, as a result of French urging and an increase in French capital participation in the Banco del Perú y Londres, a committee composed of three to five members was formed in December 1909 in Paris. The Paris Committee was similar to that which the Banco Nacional de Mexico had in Paris with agency powers to propose financial business of importance in Europe and to organize French stockholders' representation. The Paris Committee of the Banco del Perú y Londres had, however, a majority of the British-Peruvian bloc composed of Jose Payán, Ernesto F. Ayulo and a director of the London Bank of Mexico & S.A., Henry M. Read, and one French member sympathetic to the bloc's interests, James Kulp, administrator of the Banque Française pour le Commerce et l'Industrie. Initially the committee helped to carry important international transactions (the Lima Municipal loan, the loan guaranteed by salt consumption taxes), but a new modification of the bank's statutes in February 1913 enhanced the administrative power of the Paris Committee. Thereafter the reformed committee proved to be ill fated because it divided the bank's power of decision and became a cause of conflict with the Board of Directors (renamed in 1913 as Consejo de Adminstración). As a result of the 1913 statutes, the directors in Lima had to consider the veto power of the Paris Committee in every transaction above Lp. 100,000 and had to submit the bank's annual balances and accounts for approval in Paris. The Société Générale's and the Banque de Paris' interest in controlling the Banco del Perú y Londres was behind the granting of these new powers to the Committee.[45]

Why did the Banco del Perú y Londres' local financiers so eagerly desire foreign participation and thus, allow extensive foreign control and management, a policy that eventually brought many difficulties? Part of the answer lies in the fact that since 1879 the London and Paris financial markets had been closed to new Peruvian ventures and foreign capital had been careful to avoid Peruvian partners. Thus, no large investments with mixed participation, except the Banco del Perú y Londres'

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[44] Simon to Pichon, 15 Aug 1909, and 8 Oct. 1909, B31 345, AMEF.

[45] Banco del Perú y Londres, "Directorio," vol. 5, no. 638, July 1909, p. 122; "Accionistas," vol. 2, 13 Aug. 1910, p. 92; ibid., Extraordinaria, 20 Feb 1913, pp. 114-115, BPLS.

1897 merger, occurred in Peru between 1880 and 1907. Suddenly, around 1907, in the midst of an international recession, foreign capital began to pour into the reduced Lima market in search of untapped opportunities. English, German, French, and Italian financial institutions competed with each other to secure exclusivity in the allocation of foreign loans that had limited guarantees in Peru. Under these conditions of easy financial capital supply, the local liberality toward foreign capital was excessive. The accepted economic supposition at the time was that foreign capital in any quantity was good per se in countries like Peru.

The local administrators of the Banco del Perú y Londres also had other reasons, apart from the ideological one, to desire foreign participation. They saw in their partnership with English and French financial capital a guarantee for maintaining the bank's supremacy over the Peruvian market and for successfully overwhelming the competition. They soon learned modern monopolistic methods of scale from their European seniors and became very active in organizing trusts, syndicates, and holding companies in Peru and abroad.

The mortgage affair of the Crédit Foncier Peruvien was a major reason for the subsequent decline of the Banco del Perú y Londres. In the period 1907-1913, the mortgage section of the local bank had a remarkable stability compared with its other banking activities, although the depression had brought a temporary slowdown of the mortgage business in Peru. In 1907, the bank's local management became convinced that real estate financing would provide exceptional investment opportunities in the near future. With this perspective, the bank provided prompt credit to certain initiatives by the town council toward urban improvements and services that would result in an increase in the value of the bank's own real estate holdings. The bank opened a section to sell urban property on credit in 1907. This *venta de inmuebles* section dealt primarily with those properties administered by the bank's concern, the Sociedad Anónima de Construcciones y Ahorros La Colmena. In 1910 the bank directors granted the city council a mortgage credit of Lp. 42,000 to cover the costs of the expropriations needed to build the avenue La Colmena on lands owned primarily by the bank. Likewise, in 1911, manager José Payán managed to obtain the quotation in London of a Lp. 600,000 municipal loan bond issue that initially received a poor response. Furthermore, the bank advanced additional credit for Lp. 70,000 needed to secure the success of that foreign loan to the municipality of Lima by purchasing the privately owned water supply company (Empresa del Agua). All of

this financing prepared the foundations for the later real estate boom in Lima.[46]

After contributing to the preparations for a profitable real estate business, the next step taken by the Banco del Perú y Londres' administration toward the sharing and eventual surrender of its mortgage business to a French capitalized corporation proved ill fated. The objective of the mortgage combination was to attract cheap foreign capital in order to monopolize the mortgage business in Lima by reducing mortgage interest from 8% to 6% annually: "with the objective of monopolizing and increasing the loans, and avoiding competition, we think that the interest should not be more than 6%."[47]

The result of Payán's deals in Paris was the formation of the Crédit Foncier Peruvien in March 1912 with a minority participation of the Banco del Perú y Londres and the Anglo South American Bank of 337,000 out of 1,250,000 francs in capital shares and a majority of the institution's capital in the hands of the Société Générale-Banque de Paris group. The Crédit Foncier had its headquarters in Paris and an agency in Lima, managed by five directors of the Banco del Perú y Londres. The most important decisions concerning the institution's financial policy were made in Paris. Immediately after the establishment of the Crédit Foncier, the Parisian Banque Priveé advanced 12,500,000 French francs at 89% discount, after finance charges, in 5% mortgage bonds to be repaid in thirty-seven years immediately after the establishment of the Crédit Foncier. In its turn, the Crédit Foncier had acquired the totality of the Banco del Perú y Londres mortgage credits in Peru, which were then sold to the Banque Priveé. Later, the Banco del Perú y Londres acquired 500,000 French francs in bonds of the Crédit Foncier from the Banque Priveé, at the value of 90.5% (1.5% above the initial loan granted by the Banque Priveé for the purchase of bonds in Peru) "as a means of inspiring confidence considering the political movements in Lima."[48]

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[46] Banco del Perú y Londres, *Ley sobre venta de inmuebles per mensualidades; formulario para contratos y transferencias* (Lima Imp. Gil, 1908). The law enacted in 14 Nov 1900 limited interest rates on sales of houses to 10%, Banco del Perú y Londres, "Directorio," vol. 5, no. 706, 2 June 1910, pp. 247-248; vol. 6, no. 811, 23 May 1911, pp. 9-13; and no. 849, 14 Dec. 1911, p. 112, BPLS; *Boletín Municipal*, 14, no. 686, 21 Feb 1914; and 15, no. 732, 9 Jan 1915.

[47] Payán to Board of Directors about the formation of the Crédit Foncier Peruvien: Banco del Perú y Londres, "Directorio," vol. 6, no. 863, 14 March 1912, pp. 172-174, BPLS.

[48] Ibid., no. 874, 30 May 1912, p. 214.

An essential point in the statutes of the Crédit Foncier stated that new mortgage loans would be offered in Lima at 6.5% annual interest and that the old mortgage loans would have interest rates lowered from 8% to 6.5%. Difficulties soon arose from contradictions between the Crédit Foncier's administration in Paris and the Lima agency controlled by the local directors of the Banco del Perú y Londres. In April 1912, the Lima representatives communicated to Paris that the Banco del Perú y Londres would itself suffer serious difficulties and conflicts with local mortgage bond investors because of the extremely short period of time scheduled for canceling the old mortgage bonds. The Lima mortgage bond investors were deeply disturbed by the fact that their Lp. 408,000 previously placed in reliable mortgage bonds would have no secure alternative allocation. As a consequence, local capital was in danger of flowing abroad in search of profit opportunities. Another consequence would be the increase in demands for deposits in local banks. The Banco del Perú y Londres did not have the capacity to absorb more deposits desperately seeking interest because of the already excessive liabilities it held in relation to the limited possibilities for investment in Peru at that time.[49] The proposal by the local directors for a slower amortization of the displaced mortgage bonds was, however, rejected in Paris. Payán responded from Paris that the cancellation of bonds should be completed by July of that same year because otherwise the Crédit Foncier in Paris would have to defray interest costs at 6% during the entire period of cancellation. The shorter the time of cancellation the better for the French intermediaries. Peruvian investors had to be sacrificed.

The Local Board of Directors was forced to comply with this order from Paris. This had negative consequences for the bank's prestige in Lima, as well as negative economic effects brought about by the displacement of native capital by foreign financing.[50] Even though the cancellation was completed rapidly, the Crédit Foncier complained in March 1913 that it had suffered a net loss of £2,130 as a result of the costs of gold transfers to Lima and interest foregone. Payán had recommended not selling too many bills of exchange in Lima in consideration of the depreciation effects such a move would have had on the local currency and exchange market.[51]

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[49] Ibid., no. 867, April 1912, pp. 190-191; also Inspección Fiscal de Bancos Hipotecarios, *Informe del aõ 1912* (Lima, 1913).

[50] Banco del Perú y Londres, "Directorio," vol. 6, no. 868, 18 April 1912, p. 198, BPLS.

[51] Crédit Foncier Peruvien, "Note sur les frais de transfert de fonds á Lima," 6 March 1913, loose typescript, BPLS.

The most acute conflict and the one that almost broke all relations between Lima and Paris arose from the decision of the Paris administration to raise the interest rate on mortgage loans to 8% in March 1913. Until then the financial results of the first year of the Crédit's activity in Lima had been considered quite good, despite the difficulties caused in terms of capital supply. On this occasion, the local directors reacted in absolute opposition to Paris' determination to raise interest rates. Mortgage credit granting was paralyzed, thereby causing difficulties among traditional credit recipients who expected loans at low interest rates. Because the Crédit Foncier operated in Lima from the Banco del Perú y Londres' main headquarters, the paralysis of mortgage credit activities profoundly affected the banks' prestige and gave an enormous advantage to competitor institutions that were lending at a low 6.5% interest rate. The answer of the French to the local directors' opposition to raising the rate was an attempt in June 1913 to gain absolute control over the Crédit Foncier by the Banque de Paris-Société Générale group. The local directors reacted to this attempt by proposing to sell their participation in the Crédit Foncier and to re-open the Banco del Perú y Londres' old mortgage section. It was too late, however, to attempt disengagement from the Crédit Foncier.[52]

Preoccupation over losing their precious financial connections in Paris finally became the main argument that forced the local directors in January 1914 to comply with the Parisian request for an increase in the mortgage loan interest rate "with the intention of avoiding any reasons for friction with the gentlemen in Paris."[53] Thereafter, the Crédit Foncier's mortgage business in Lima absolutely collapsed and, contrary to its designs, the Banco del Perú y Londres lost its supremacy over the mortgage market to other institutions (Banco de Crédito Hipotecario, Banco Italiano).

The examples of crowding-out effects multiplied in the 1920s and thereafter. Among the most notable examples were the British interests in the Marconi Telegraph Co., the Italian and Swiss interests in the electrical conglomerate Empresas Eléctricas Asociadas, the Swedish Match Monopoly, the Peruvian Glass & Bottle Co., Foundation Co., Cia. Peruana de Cemento Portland, and Frederick Snare & Co. In later years the following multinationals invested in Peru: the ITT-dominated Compañía Peruana de Teléfonos (1930), Goodyear (1943), and thanks to the liberal mining and petroleum laws (1950, 1952), Southern Peru Copper Corporation (American Smelting and Refining Co., 1952),

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52 Banco del Perú y Londres, "Directorio," vol. 6, no. 914, March 1913, p. 340; ibid., vol. 7, no. 929, 9 June 1913, pp. 23-26; no 930, 12 June 1913, p. 24, no. 931, 19 June 1913, p. 37, BPLS.

53 Ibid., no. 961, 8 Jan 1914, pp. 154-155.

Marcona Mining Co. (1952), Anderson Clayton & Co., Constructora Emkay, Morrison-Knudsen Co., General Motors (1952) and Sears (1955).(Goodsell, 1974). Despite the advance of foreign interests, the native export and agro-export interests had a last stand during the neo-liberal regime of dictator Manuel A. Odría (1948-1956).

6. Regained International Credit

Not until 1952 did the Peruvian government negotiate a definitive arrangement of its old (pre-1930) debt. In 1947, there had been a new attempt to settle the issue in a unilateral way by the regime of Bustamante y Rivero. This attempt failed despite Bustamante's eagerness to regain access to foreign credit (Bustamante y Rivero, 1949). Odría deposed Bustamante on the basis of fears of the populist party's (APRA) rise to power, and through opposition to the economic and financial management that had introduced foreign exchange controls. Odría re-imposed orthodox financial policies to stabilize the currency and lower inflation (Suárez and Tovar, 1967, p. 17). The measures were relatively effective. Additionally, the export boom during the Korean War allowed a correction of the Peruvian balance of trade. U.S. financial advisor Julius Klein contributed to these changes.

In addition to these internal re-arrangements, it was one of Odría's policies to re-negotiate the foreign debt in 1952. By 1955, repayment schedules had been agreed upon as the basis for debt reduction in the form of the condoning of interest accrued between 1930 and 1946 (Suárez and Tovar, 1967, p. 18). With new foreign loans forthcoming as a result of this arrangement, Odría was thus, finally able to carry on his populist-demagogic program of public works and social security.

New loans from foreign creditors were contracted for a total amount of US$980 million between 1950 and 1965. Approximately 48% of this amount was granted by private suppliers of goods, 31% by U.S. and other government agencies, and 21% by international banks and organizations (see Table 1) (Suárez and Tovar, 1967, p. 14, Table 1). A substantial number of these loans were, however, tied to specific purchases of imports. If we analyze Figure 1 and attempt to relate it to the figures of foreign indebtedness in Table 1, it is possible to establish a link between increased foreign lending and the expansion of local banks' deposits and loans.

Unlike the previous cycle of public loan expansion, the new loans left little room for untied developmental uses. In fact, many loans in the 1950s and 1960s were used for military and defense purposes (Portocarrero et al., 1988). This pattern was to be continued into the 1970s with the additional factor of an over-

supply of foreign commercial loans to a military government keen on bureaucratic expansion.

Crowding-out effects, state interventionism fueled by foreign public loans, and internationally led inflows and outflows of foreign capital limited the developmental effects of the relationship between domestic and foreign finance in Peru. By inhibiting the growth of the local private sector, foreign capital and the state canceled the possibility of a financially viable capitalism in Peru, and fostered instead a bureaucratically led economic environment where graft and unsound economic decisions predominated.

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Saving and Wealth Accumulation of Chinese Rural and Urban Households: A Cross-Sectional and Comparative Study

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1. Introduction

Saving, or wealth accumulation, has been at the core of economic development for two reasons. On one hand, it has been considered one of the primary sources of economic development. On the other hand, it is directly related to people's welfare and living standard -- the very goal of development. Traditional growth theory emphasized the crucial role for saving and accumulation of physical capital. Indeed, Lewis went so far as to assert that the "central problem in the theory of economic development is to understand the process by which a community which was previously saving 4 or 5% of its national income or less converts itself into an economy where voluntary saving is about 12 to 15% of national income or more" (Lewis, 1954, p. 155). Numerous studies have been focused on the relations between savings and growth, although the results are not all unambiguous and non-controversial.[1] Although few found that saving alone can motivate economic growth, it is unlikely that sustained growth can be achieved without a higher domestic saving rate. In

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[1] See Deaton (1989) and Stern (1989) for discussions.

a recent paper, Deaton (1989) emphasized the role of saving in protecting the living standard of poor people whose income is low and uncertain. Saving, in his opinion, is not only about growth, "it is about smoothing consumption in the face of volatile and unpredictable income." Given the significance of saving in economic development, it is important to investigate the determinants of household saving, its future trend, and the policy implications.

China's domestic saving rate has been among the highest in less developed countries, at about 30% of GDP in the last three decades. Household saving rose and its share in domestic savings increased rapidly during the economic reform. The saving behavior of Chinese households and its trend have therefore received attention, but most of the previous studies on Chinese savings have used aggregate time series data. Many important determinants of saving, such as age, education, occupation, and regional differences, cannot be investigated by time series analysis. A household survey on consumption and savings conducted by the Chinese Academy of Social Sciences (CASS) is now available, which facilitates research on the economic behavior of more than one billion Chinese.[2]

The objective of this research is to investigate the saving and wealth accumulation behavior of Chinese rural and urban households by applying life-cycle/permanent income models. Questions being asked here include first, what are the determinants of permanent income for Chinese households? Can wages and salaries be treated as permanent income, given their stability in China's urban sector? Second, how and to what extent are the household cumulated savings (wealth) affected by household permanent income, transitory income, age, occupation, and other taste shifters? Third, is there a "survival threshold" income below which households are unable to save? Fourth, do Chinese households need to dissave after retirement, given a good pension system in the urban sector and extended families in the rural sector? Finally, from the findings of this research, what can be considered appropriate policies for China's resource mobilization, poverty alleviation, and social security system? These are research questions that have never been investigated. The examination of these questions will help us to understand the household behavior and the trend of savings in a command economy under rapid transition, which may illuminate government policies for China as well as for other socialist economies under transition.

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[2] The survey is jointly being analyzed by the London School of Economics and CASS, under the general direction of Ehtisham Ahmad, Athar Hussain, and Nicholas Stern. I am grateful to them for providing the data set.

The theoretical background of this paper includes well-documented bodies of literature on Friedman's permanent income hypothesis (PIH), Modigliani-Brumberg's life-cycle hypothesis (LCH), and Becker's theory of allocation of time over life-cycle. These models have been widely applied to industrial market economies, and later to less developed economies.[3] Several empirical studies have been conducted on Chinese savings since 1982. De Wulf and Goldstein (1983, 1985) and Naughton (1986) estimated saving functions for China by applying conventional linear models to aggregated time series data. Armitage (1986) estimated saving functions for rural and urban households separately using household survey data aggregated at the provincial and city level. Her estimation favored the permanent income model over the absolute income model for the rural sector in 1984, although no comparison could be made for the urban sector because of the small number of observations. Feltenstein, Lebow, and van Wijnbergen (1986) dealt with the potential disequilibrium in the Chinese economy more carefully by constructing a "virtual price" and a "real virtual interest rate." Their conclusion implied that the rapid increase in household saving was due mainly to the increased money supply and the increased degree of repressed inflation. Qian (1988) tried to explain the recent increase in household savings by allowing for possible structural changes in household saving behavior. The estimated saving functions consistently showed a substantial difference in saving behavior before and after economic reform, with a higher marginal propensity to save (MPS) in the rural sector, as expected. Jefferson (1989) investigated the impact of economic structure on the fertility, saving, and retirement behavior of Chinese households, using a compilation of aggregate data from 317 cities for 1987.

The above studies used either aggregate time series data or cross-sectional data aggregated at the city or provincial level. A problem with the above studies concerns the definition of saving. Constrained by data availability, previous studies could examine only the financial savings (bank deposits) of the households. They were unable to include changes in other components of household wealth such as the value of consumer durables and private housing in savings. Another problem is that, with limited information given by aggregate data, it is difficult to analyze the effects of factors other than income, such as age, education, and occupation. The present study attempts to solve the above problems by exploring the rich information provided by a cross-sectional household survey data, and hopefully, to fill in some of these gaps left by previous studies.

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[3] See Snyder (1974) and Gersovitz (1988) for surveys of the literature.

Section 2 first provides some background information on the socioeconomic environment for Chinese households. A simple life-cycle/permanent income model of saving and wealth accumulation is then built, and some hypotheses are presented. The basic idea underlying this model is that a household tries to smooth its consumption stream over the life-cycle by saving and dissaving. Given the current information on household members' education, occupation, and the economic conditions of a country, the household would have some expectations about its future income stream. Taking the expected life-cycle or permanent income as given, the household makes decisions on its consumption and saving in each period accordingly. This model has been used in empirical studies for many developed and developing countries. However, there is no reason to believe that the model is applicable to Chinese households whose environment is under dramatic transformation from a centrally planned economy to a market oriented economy. Therefore, we need to test the hypotheses that permanent income can actually explain the variations in savings and wealth; that the age profiles of savings do show the usual "hump" shape; that poor households with income below a poverty line have lower marginal propensities to save than better-off households; and that households with different occupations tend to have different saving behavior.

To test these hypotheses, the instrumental variable procedure is used, and two steps are taken in empirical analysis. First, permanent incomes for rural and urban households are estimated separately, based on variables reflecting the human capital stock of a household. Second, equations for wealth accumulation are estimated separately for rural and urban households, using the estimated permanent income, transitory income, age, and other taste shifters as independent variables. In order to assess the sensitivity of the estimated equations, models with different measures of permanent income are estimated and compared. In Section 3, descriptive analysis of the data set is presented and methodological issues are discussed. The level and composition of wealth, the saving rate, and income/wealth ratios for rural and urban households are compared and discussed. Section 4 presents the results from step one, the estimation of permanent income for rural and urban households. Section 5 examines the results in the estimation of wealth equations and hypothesis testing. In Section 6, we compare the results with a similar study on American household saving behavior based on the Survey of Consumer Finances (Wang, 1989). Policy implications are discussed on the difference between the "money-saving" behavior of Chinese households and the "time-saving" behavior of American households.

2. Theoretical Framework

2.1 Socioeconomic environment for Chinese households

The Chinese economy has been undergoing rapid and fundamental changes since 1978, transforming from a closed, centrally planned economy to a more open economy with a market orientation. The following characteristics of socioeconomic environment have been affecting Chinese household saving behavior and should be taken into account.

First, China is a large low-income developing country with a per capita annual income of less than $350 and a large proportion of its population living in poverty. The number of poor people with per capita income below 200 yuan (about $54) was 102 million, or 12.2% of the rural population in 1985 (China, State Council, 1989), with a slight increase in 1988.[4] These individuals/households with income at a subsistence level may have different saving behavior from that of better-off households. Therefore, the "survival threshold" hypothesis may be relevant in the Chinese context; that is, poor people living below the survival threshold may save very little if at all. Moreover, borrowing for consumption purposes was constrained by the underdevelopment of credit markets. Because of the shortage of capital, financial intermediaries are unwilling to lend for consumption purposes. Thus, liquidity constraint is a relevant concept in the Chinese context.

Second, China is a centrally planned economy in which public ownership prevails and individuals' choice sets are manipulated. Prior to 1978, the rate of public saving was kept high, and the prices of agricultural products and urban wages were kept low and stable in order to finance China's industrialization. Basic consumption was ensured by land accessibility and grain transfers in rural areas; and by employment guarantee, rationing, pensions, and medical services in urban areas. A household's motivation to save may have been reduced because uncertainty in income was greatly reduced with the working-unit based social welfare system. Meanwhile, the shortage of consumer goods may have caused disequilibrium between the desired and observed saving in the past. Although the supply of consumer goods has become more abundant in recent years, one should not ignore the impact of involuntary savings on wealth (cumulated savings).

Third, substantial changes took place after the economic reform. There has been a rapid increase in household nominal

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[4] For a detailed discussion about poverty, see Ahmad and Wang (1990).

income in both rural and urban areas. The average annual per capita net income of peasant households increased from 134 yuan in 1978 to 545 yuan in 1988. The average annual per capita income of urban households rose from 458 yuan in 1981 to 1,119 yuan in 1988 (China, SSB, 1989). However, real income leveled out after 1984, mainly because of escalated inflation.[5] Households in rural areas have become independent production and investment units. The fluctuation of prices for farm inputs and products made farmers' incomes more volatile. The dissolution of rural cooperative health care and social security systems made it necessary to have precautionary savings. In the urban sector, the introduction of the contract worker system, the possibility of enterprise bankruptcy, and the recent inflation increased the uncertainty in future employment and real income. The increases in the level of risk and uncertainty in the economic environment since reform provide more incentive to save.

On the other hand, other factors may have depressed financial savings and changed the composition of wealth. For example, higher expected rates of inflation and negative real rates of interest increased the opportunity cost of investing in financial assets, and thus encouraged investment in consumer durables and housing. Also, the improved supply of consumer goods and the trend of "keeping up with the Joneses" has encouraged the purchasing of consumer durables. Therefore, economic reform affects not only the incremental amount of wealth, but the composition as well.

Fourth, social characteristics of the Chinese culture may also affect household saving. For example, the proportion of extended families in China is much larger than those in developed countries. Close family ties and the obligation for adult children to support their parents may have provided an alternative insurance for old age and reduced the need to save for retirement. The conventional "hump" shape of saving, which will be examined in this study, may or may not be observed in China.

2.2 A simple life-cycle/permanent income model

The basic idea underlying the life-cycle model of Modigliani and Brumberg is that individuals try to compensate for the fluctuations in income and prices over the life-cycle by saving and dissaving. Friedman's permanent income hypothesis utilizes a similar idea with the emphasis on economic fluctuations rather than the life-cycle. Although numerous modifications of the

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[5] The official annual inflation rates were 18% in both 1988 and 1989, but were sometimes as high as 30% in large and medium-sized cities. For details of the adverse effects of inflation, see Ahmad and Wang (1990).

basic life-cycle/permanent income model have been developed, this study uses the following non-stochastic replanning model that has the merit of simplicity and feasibility of empirical testing.

It is assumed that a representative household maximizes its utility from consumption over the remaining life span, i=(t, t+1, ...T), with the terminating period, T, known for certain,[6] and the intertemporal utility function additively separable. The lifetime utility at time t, V_t, can then be expressed as the summation of the discounted period-by-period utility (with the discount rate $0<\delta<1$) in the remaining life span:

$$V = \sum_{i=t}^{T} \delta^{i-t} U(C_i, Z^i, e_i) \tag{2.1}$$

where C_i is the consumption at time i, Z^i is a vector of observed taste shifters, and e_i is the taste shifters unobservable to the researcher. Given that the household does not leave bequests and that it can borrow and lend at an interest rate r, the resource constraint is that the present value of lifetime consumption cannot exceed the present value of lifetime wealth expected at time t, Ω_t:

$$\sum_{i=t}^{T} \frac{Ci}{(1+r)^{i-t}} \leq (1+r)W_{t-1} + \sum_{i=t}^{T} \frac{Yi}{(1+r)^{1-t}} \equiv \Omega_t \tag{2.2}$$

where r is the real interest rate, W_{t-1} is the existing household non-human wealth, Y_i is the expected labor income in each period i, and Ω_t is the total lifetime wealth expected at time t.

Under an intertemporal separability assumption, the above utility maximization problem can be solved by first allocating the lifetime wealth to each period such that the discounted marginal utility from wealth is equalized, and then dividing the resources available for time t between consumption and saving. The first order condition of the above problem can be expressed as:

$$U'(C_i) = \delta(1+r)U'(C_{i+1}) \tag{2.3}$$

which yields optimal values of consumption. Saving is then the residual between the current income and the optimal consumption.

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[6] The assumption of a certain life span can be justified on the ground that, in a replanning model, a household is allowed to correct its expectation errors in life span and other variables at the beginning of each planning period.

Friedman (1957) introduced the concept of permanent income as a determinant of consumption and saving. The basic idea is consistent with the above life-cycle model: saving depends on future resources as well as current resources. Assuming homothetic utility, the household chooses consumption at time t, C_t^*, proportional to its lifetime resources; that is,

$$C_t^* = k\Omega_t \equiv Y^P \tag{2.4}$$

with Y^P defined as permanent income and the proportion, k, as a function of expected real rate of interest and taste shifters. Since saving is the residual between current income and optimal consumption, (2.4) can be the basis for specifying saving as a function of permanent income and transitory income in the following estimable form:

$$S_t = \alpha + \beta Y^P{}_t + \Gamma\left(Y_t - Y^P{}_t\right) + \varepsilon_t \tag{2.5}$$

where β is the marginal propensity to save (MPS) from permanent income and Γ is the MPS from transitory income defined as the difference between current income, Y_t, and permanent income. Previous studies of the developing countries often found that permanent income is a significant determinant of saving, and the MPS from transitory income is usually higher than that from permanent income.

Owing to the difficulty of measuring annual savings in the CASS survey, the above model will now be modified to characterize wealth accumulation rather than savings. Define household non-human wealth at time t, W_t, as the summation of the past savings:

$$W_t = \sum_{i=0}^{t} S_i \tag{2.6}$$

which includes both financial assets as well as physical assets (consumer durables and private housing). Substituting (2.5) into (2.6), W_t can be expressed as a function of permanent income, $Y^P{}_t$, transitory income, $y^T{}_t$, age, A_t, and a vector of taste shifters, Z^t:

$$W_t = f\left(Y^P{}_t, Y^T{}_t, A_t, Z^t\right) + u_t \tag{2.7}$$

The functional form is left flexible since the objective is not to test the permanent income hypothesis per se, but rather to explore the model(s) that can best characterize the wealth accumulation behavior of Chinese households.

2.3 Hypotheses

Based on the characteristics of Chinese economy, one may suspect that the conventional life-cycle/permanent income models may not apply to Chinese households. Therefore, the following hypotheses are tested in the empirical analysis.

Hypothesis I: Although capital market imperfection or liquidity constraint prevails in all developing countries, previous studies confirmed the applicability of conventional life-cycle/permanent income models in these countries. Therefore, the first hypothesis is that, permanent income can explain the variations in savings and wealth accumulation of Chinese households, in spite of the existence of capital market imperfection.

Hypothesis II: Since survival is the primary concern of households living under the poverty line, we hypothesize that the marginal propensity to cumulate wealth for poor households is significantly less than that of households living above the poverty line.

Hypothesis III: We hypothesize that household savings over the life-cycle show the usual "hump" shape in China as in other countries. In other words, Chinese households need to dissave after retirement even under the protection of the social security system in the urban sector and the extended family in the rural sector.

Hypothesis IV: Households whose head is employed in the private sector or in agriculture have a higher propensity to cumulate wealth, since their income is relatively more uncertain. One implication of this hypothesis is that aggregate household saving may increase as the private sector grows larger and the uncertainty in the economy increases along with the economic reform.

3. Data and Descriptive Analysis

3.1 Data

This study uses a household survey, the Consumption and Savings of Chinese Rural and Urban Households (1986), designed by the Institute of Economics (CASS) and collected by the State Statistical Bureau (SSB) in 1987. It is based on questionnaires for urban and rural areas. It contains information on household

income, size, location, year-end figure of financial assets, consumer durables and housing, and human capital characteristics of household heads. It also has information on households' expectations about future prices, income and employment opportunities, intentions for future purchasing, attitudes toward borrowing, and motivations for saving.

A drawback of the data set is that it has information on the *stock of savings, or wealth* only, but not on the increment of savings or consumption expenditure for the year. Therefore, it is impossible to observe household annual savings, defined as the changes in the household wealth between two years, or as income minus consumption. Another problem is that the sample is not random for the entire population. The urban sample consists of 5,000 households from twenty-eight of the twenty-nine provinces (with Tibet missing). The rural sample consists of 3,941 households from only ten provinces. Some provinces are oversampled, while others are undersampled. Fan and Ludlow (1990) examined the general quality of the CASS data. Despite the above problems, they found that there is a high correlation between the average per capita income by provinces reported from the CASS data and those published in the *Statistical Yearbook of China* (*SYB*) (with the correlation coefficient of 0.82 for urban sample, and 0.99 for rural sample). The average size of households in the sample (3.83 for urban, 4.98 for rural) also compares well with the *SYB* data (3.82 for urban, 5.01 for rural households).

In the process of cleaning the data set, I deleted a substantial number of observations because of non-response/punching errors, for example, missing provincial code, or zero household members.[7] Owing to the tradition of choosing a male as the household head, there are observations with the age of the household head as young as one, or as old as ninety-three. These are multi-generation households with the household size larger than three. With a non-earning member as the household head, the age, education, and occupation of the head have little to do with household income and wealth. Therefore, households with heads younger than twenty or older than sixty-five are excluded. After data cleaning, 3,860 observations are left in the urban samples and 3,648 observations in the rural samples. Weights are constructed for urban and rural samples, by the ratio of population proportion and sample proportion for each province, in which the population is defined as the urban (rural) population in the surveyed provinces (twenty-eight for urban, ten for rural

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[7] Seven hundred of the urban households are deleted because of the missing provincial code, which is needed in constructing sample weights. For details on data cleaning, see Hussain, Ludlow, Wang, and Qian (1990).

sample). This will partially solve the problem of oversampling or undersampling. The sample may therefore be considered representative of the mature households (with the head aged twenty to sixty-five) in the surveyed provinces.

3.2 Measurement of wealth and savings

Although annual saving is not directly observable in the CASS data, a synthetic cohort technique may be used to calculate saving from wealth variables. In this subsection, I discuss the measurement of wealth variables and the method of calculating saving variables. Some descriptive statistics will be presented in the next subsection.[8]

Household *wealth*, W_t, is defined as the household non-human wealth, measured by the summation of total financial assets (cash, bank deposits, and government bonds), current value of consumer durables, and value of farm tools and private housing (for rural households only). Among financial assets, the value of stocks for share-holding companies is excluded because there are severe reporting errors in the definition and evaluation of the stocks. Consumer durables, farm tools, and housing are evaluated at current market value by the respondents and suffer from measurement errors owing to the market imperfection. They are included without adjustment because these are important components of household wealth and there is little information for the re-evaluation of these variables. However, the consequences of measurement errors in dependent variables are not as severe as those in independent variables. The estimated coefficients would still be consistent. Different components of the household wealth are also examined when necessary in order to separate the measurement errors in, say, housing, from other types of wealth.

Household *saving* is defined as the difference in household non-human wealth between two neighboring age groups in the same education/occupation (E/O) category. Denote i (i=1,...6) as the index for the educational level of the household head, and j (j=1, ...4) as the index for the occupation of the household head. Define $W_{i,j,t}$ as the net wealth of a household in the ith educations, jth occupational category at age t; similarly, $W_{i,j,t-1}$ as the net wealth of a household in the same E/O category at age t-1. Then household saving can be measured as:

$$S_{i,j,t} = W_{i,j,t} - W_{i,j,t-1} \tag{3.1}$$

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[8] A synthetic cohort technique was conducted in Ghez and Becker (1975). I am indebted to Professor Hak K. Pyo for the suggestion of using this method in the present study.

where a bar denotes a mean value.

This is the synthetic cohort technique. The basic idea is to calculate savings by first grouping the sample into E/O categories, then taking the mean values of the household wealth in each E/O category by age groups, and lastly, taking the difference between the mean wealth of each pair of neighboring age groups in the same E/O category. The underlying assumption is that household saving behavior over the life-cycle can be simulated by the average savings of each cohort group in a cross-sectional data set. There are advantages and problems with this technique. In some cross-sectional data sets, like the present one, only wealth and income information are available. The synthetic cohort technique provides the only way to calculate savings using the available information on wealth. One problem with this technique is that useful information is lost in the process of taking the mean values of wealth between age groups. Another problem is that it confounds cohort effects on saving with life-cycle effects. For instance, a thrity-year-old would probably have different saving behavior when he reaches age fifty than those who are fifty years old now, owing to changes in the socioeconomic environment for each birth cohort. Thus, the age coefficients in the savings equations would reflect not only the life-cycle effects but also the cohort differences in saving behavior. The most severe problem in applying this method is that not enough observations can be obtained because of the uneven distribution of observations in each E/O category and each age group. Precisely for this reason, it is impossible to calculate annual savings in this study. Instead, savings in five-year intervals are calculated with the descriptive statistics presented in Section 3.3.

3.3 Descriptive statistics

A descriptive analysis on household characteristics, the possession of consumer durables, and the motivations for saving was conducted in Hussain, Ludlow, Wang, and Qian (1990). This subsection presents only the weighted group means of income, wealth (and its components), and saving *by age groups*, in order to examine the life-cycle pattern of these variables.

Figures 1, 2, and 3 show the age profiles and composition of household wealth, income, savings, saving rates, and wealth/income ratios for the urban households. Figures 4, 5, and 6 give the same set of curves for rural households. Generally, the distribution of wealth and income among age groups shows the "hump" shape (with the peaks at age fifty to fifty-five) that is often found in other countries. In Figure 1, urban households show a different preference for financial assets and durables: younger cohorts tend to invest in consumer durables, whereas older

cohorts prefer to hold financial assets. Rural households invest about 61% of their wealth in private housing.

Figure 2 and Figure 5 show the age profiles of wealth, income, and saving. Here, saving is defined as the changes in household wealth between two neighboring five-year age groups. It shows a pattern consistent with the life-cycle hypothesis of saving: a household saves more in the early stage of its formation, saves less in the presence of young children, saves more when children are grown up and earn income, and saves less or dissaves after retirement. In Figure 2, household income declines drastically after age sixty (the retirement age is sixty for men and fifty-five for women), while household wealth declines at a slower rate. This suggests that the level of pensions is not enough for the retirees to maintain their consumption level without withdrawing from their savings. Hence, saving for retirement or old age is a valid concept in China. In Figure 5, the age profile of rural savings shows a drop at age fifty, which might be explained by children's marriage since parents are responsible for preparing dowry or betrothal gifts.

Figure 3 and Figure 6 indicate the wealth/income ratio and annual rate of saving for urban and rural households. The rate of saving is the average annual savings as a percentage of total annual income. It ranges from 5.5% to -4.9% for urban households, and from 7.6% to -5.1% for rural households, depending on the age of the household head. No overall average rate of saving can be calculated, since the cohort technique is used. These saving rates are lower than those estimated using time series data, one reason being the different definition of saving. Another reason might be the cohort effect: if younger cohorts save more and hence have more wealth, then the saving measured as the differences in wealth between two cohorts would be less than the actual savings over time. However problematic, savings calculated as such still provide useful insights into the behavioral pattern of Chinese households over their life-cycle.

Table 1 gives some descriptive statistics on the types of income and wealth received or possessed by urban and rural households. One observation is that the average income per urban household is much higher than the average income per rural household, although urban household size is smaller. With household size taken into account, urban income is 877 yuan per capita while rural income is only 431 yuan per capita (49% of the urban per capita income). Also, urban income variables have much lower standard deviations than the rural counterparts, indicating that income is distributed more equally in urban areas. One needs to be cautious in making urban/rural comparison on wealth variables, since rural wealth includes value of housing while urban wealth does not. Of the rural households, 96.4% reported non-zero housing value, which accounts for 61.5% of total household wealth. However, the

quality of rural housing varies considerably, and the value of housing is measured with error because there is no housing market in China. On the other hand, subsidized low-rent housing is available for registered urban households with large variation in its quantity (areas) and quality. Therefore, urban/rural comparison on wealth is valid only if the value of housing is excluded. On a per capita basis, urban wealth is 1,285 yuan while rural wealth is only 334 yuan (26% of urban wealth). Wealth/income ratio of rural households is higher than that of urban households if value of housing is included, whereas the ratio is only 0.76 (52% of the wealth/income ratio for urban households) excluding housing value. These facts suggest that rural households, on average, are much poorer and more vulnerable to an income shock than urban households.

Figure 1: Composition of Household Wealth for Urban Households (in 1986 yuan)

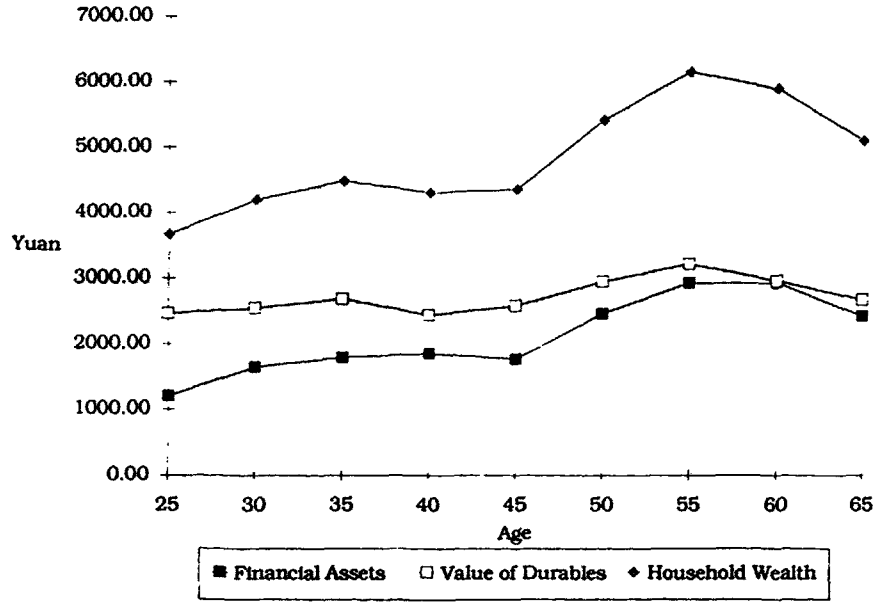

Figure 2: Wealth, Income and Savings for Urban Households (in 1986 yuan)

Figure 3: Rate of Savings and Wealth/Income Ratio for Urban Households

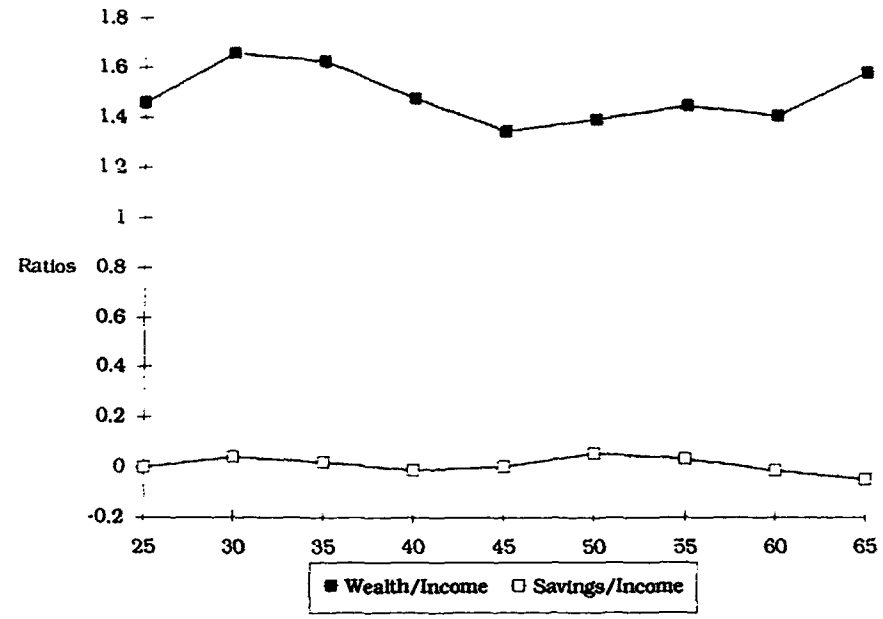

Figure 4: Composition of Household Wealth for Rural Households (in 1986 yuan)

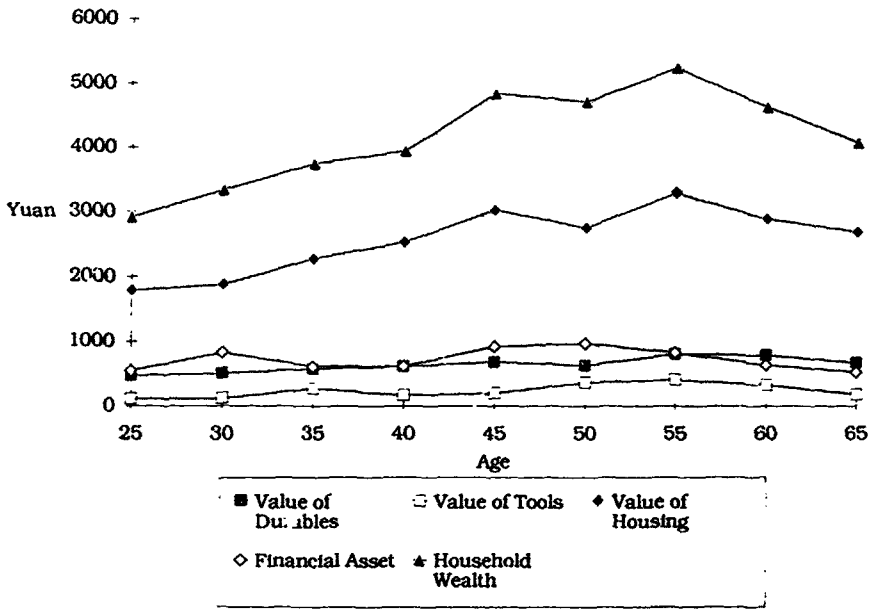

Figure 5: Wealth, Income and Savings for Rural Households (in 1986 yuan)

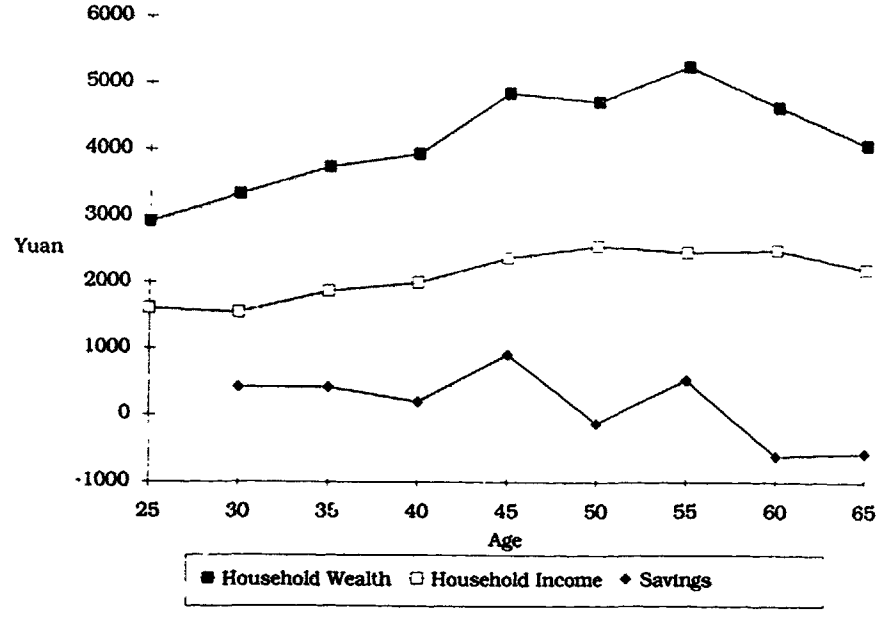

Figure 6: Rate of Savings and Wealth/Income Ratio for Rural Households

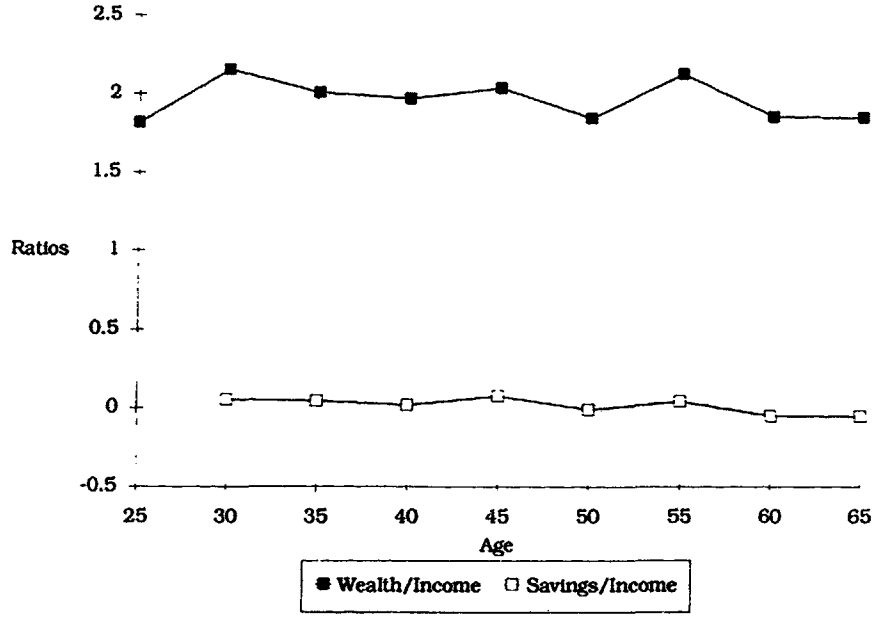

Table 1
Income and Wealth by Types: 1986
For Urban and Rural Households

Variable	Means	Comp*	Stan. Dev.	% own**
Urban Households				
Household size (person)	3.83			
Total annual income per household (yuan/year)	3360	100	1644.37	100
of which:				
Regular income	2837	84.5	1141.32	97.5
of which: wage	2348	69.9	1101.17	96.3
bonus	489	14.6	747.04	86.7
Irregular income	315	9.4	861.51	41.9
Total wealth (yuan)	4922	100	3693.12	
of which:				
Financial assets	2168	44.0	2649.80	
Value of durables	2754	56.0	2008.72	
Wealth/income ratio	1.46			
Rate of annual saving	Ranged from 5.5% to -4.9% depending on age			
Rural Households				
Household size (person)	4.98			
Total annual income per household (yuan/year)	2145	100	1503.28	100
of which:				
From hh. activities	1788	83.4	1360.21	99.6
of which: agric. income	1436	66.9	982.91	98.6
Manufacturing & construction	111	5.2	424.32	16.2
Other activity	220	10.2	483.99	55.5
Total wealth (yuan)	4244	100	5527.99	
of which:				
Financial assets	747	17.6	3164.83	95.6
Value of durables and tools	888	20.9	2812.48	94.9
Value of housing	2609	61.5	3146.72	96.8
Wealth/income ratio	1.98	(0.76 if the value of housing is excluded)		
Rate of annual saving	Ranged from 7.6% to -5.1% depending on age.			

Source: Author's calculation from the CASS data (3860 urban, 3648 rural households).

* This column is the percentage of the type of income (wealth) in total household income (wealth).

** This column is the percentage of households receiving (or possessing) the type of income (or type of wealth).

4. Estimation of Permanent Income

In the following empirical analysis on wealth accumulation, permanent income is first estimated and then used in the wealth equation as an instrumental variable. This section discusses different measures of permanent income and preliminary results in the estimation of permanent income for urban and rural households.

4.1 Permanent income for urban households

Table 1 shows that total urban household income consists of regular income (wage and bonus) and irregular income (royalties, rewards, and hardship allowance). Wage and salary account for 70%, bonus for 15%, and irregular income for less than 10% of total income. In Figure 7, wage shows a clear "hump" shape over the life-cycle, whereas bonus and irregular income do not vary much across age groups. In reality, wage and salary have been controlled by a unified scale system in the state sector (and in large collective enterprises), with little variation across occupation, region, and type of employer. This system was maintained after the reform, and a bonus system was introduced to increase the incentive to work. However, the bonus does not fluctuate much in China. It shows a steadily increasing trend and is relatively equally distributed within working units. In 1986, the bonus had become a regular component of urban household income, with 86.7% of the sample households receiving a bonus regularly. Therefore, both wage and bonus can be considered stable incomes of the urban households.

Based on these observations, I assume that permanent income of the urban households can be measured by the following three methods. First, permanent income can be estimated by an earning function based on human capital theory with total household income as the dependent variable. Second, we can also try to estimate permanent income using observed wage and bonus as the dependent variable, in order to ascertain the sensitivity of the estimates. Third, the observed wage and bonus can be considered permanent income since they are very stable, with an upward trend over time.

Table 2 presents the preliminary results of two permanent income equations (one on income, the other on wage and bonus). The model specification is based on conventional human capital theory: an individual's earning should be determined by his/her education, occupation, and experience in the labor market (with age as a proxy). In the Chinese context, the type of employer and regional dummy variable are also important determinants. The two equations are estimated using weighted least squares. The

dependent variables are monthly household income and monthly household wage and bonus, respectively.[9] Because of limited information provided in the data set, it is impossible to run the equations based on each individual's income and characteristics. This will not create any serious measurement error as long as the household head is the main bread earner. In the two equations, age, age squared, and schooling all have expected signs and are highly significant. Each additional year of schooling of the head would increase the household monthly income by 3 yuan, and each additional worker would raise the household monthly income by 66 yuan. Dummy variables for type of employer and occupation show signs consistent with our observations on Chinese income structure: with state-owned employer as a left-out category, collective enterprises offer lower incomes and wage rates, while joint ventures offer higher incomes and wage rates. It should be noted that if the head is self-employed or working in the private sector, the household income would be higher but the wage income would be significantly lower, as expected. This suggests that an equation based on wage and bonus would underestimate the permanent income of the self-employed. With the industrial worker as the left-out category, the occupation dummies show that technical, professional, and managerial personnel earn higher incomes and wage rates. If the household is located in a coastal region, its income would be significantly higher since coastal regions benefit more from trade and foreign investment. The coefficients for households with disabled head and for households located in poor regions are positive, which may be explained by compensations for disability and for working in remote regions. Overall, the equations are estimated with precision, with highly significant t ratios and adjusted R^2 ranging from 0.2856 to 0.3277.

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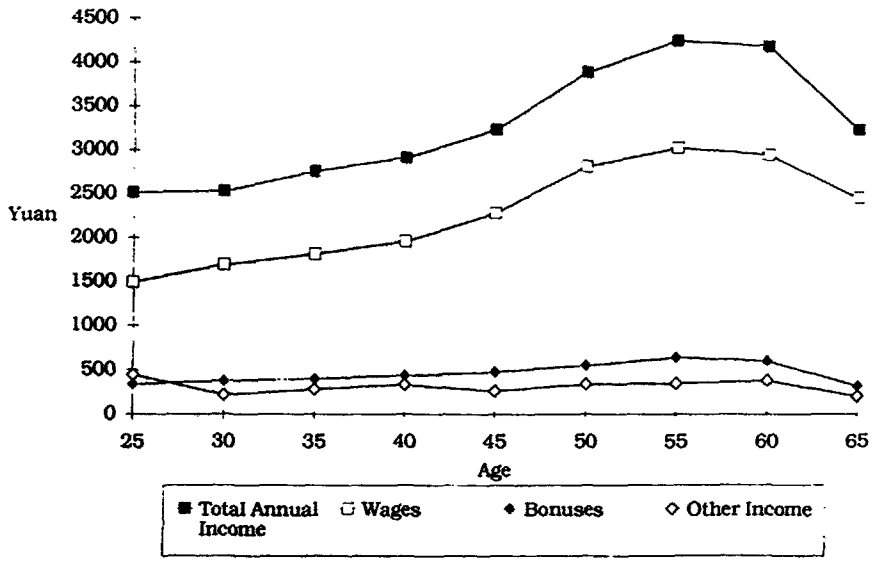
[9] Semi-log function form is conventionally used in the literature for earning functions. However, it is not used here since this is only a first attempt to estimate earning functions for Chinese households, and it is more important to explore what data tell us than impose a particular functional form. For this purpose, a linear function has the advantage of simple interpretation of coefficients in yuan terms. Also, no correction for sample selectivity is conducted since 100 percent of households have income, and 97.5 percent of households have wage and bonus.

Table 2
Estimated Permanent Income Equations for Urban Households

Variable*	MINCOME	t	MWAGEB	t
CONSTANT	-148.25	-3.7	-205.33	-5.9
AGE	8.06	4.5	9.38	5.9
AGESQ	-0.07	-3.4	-0.08	-4.8
SCHL	3.28	4.8	2.38	4.0
NUMBWK	66.08	28.6	63.53	31.6
COLLECT	-8.26	-1.6	-6.60	-1.5
PRIVATE	44.66	1.4	-165.51	-5.8
JOINTV	111.33	3.4	17.14	0.6
OTHOWN	3.07	0.2	-5.50	-0.4
TECH	9.30	1.5	17.52	3.3
MANAGER	11.70	2.2	11.40	2.5
SERVWK	0.66	0.1	13.65	2.4
NOCLASS	2.29	0.3	0.03	0.0
DISAB	66.68	3.8	31.94	2.1
COAST	31.81	7.3	24.45	6.5
POORREG	1.03	0.2	8.82	1.9
Adj. R^2	0.2856		0.3277	

* See Appendix for a description of variables.

Figure 7: Household Income and Composition for Urban Households (in 1986 yuan)



4.2 Permanent income for rural households

As shown in Table 1, rural household annual income consists of income from household-based activities (agriculture, manufacture and construction, and other activities), and income from other sources (gifts and remittances from relatives, and subsidies from collective or state funds). Of the households, 98.6% have agricultural income that accounts for 67% of the total income; 71.7% of the households have non-agricultural income, but it accounts for only 15.4% of the total income. Therefore, farming, forestry, animal husbandry, fishing, and handcrafts are still the main activities of the rural households, although non-agricultural income has been increasing since 1980. Income from non-agricultural activities is highly uncertain since there is no employment security in the township and village enterprises (TVEs). Agricultural income includes the value of output sold to the market and self-consumed. Although it is also uncertain, few rural households would give up their contracted land to move to the county town (at least up until 1986), since land provides food -- a kind of insurance for survival. Therefore, agricultural income from contracted land can be considered an income source that a household would fall back on in difficult times. Alternatively, since rural households are diversifying among agricultural and non-agricultural activities, one may treat incomes from the two sources as insurance for each other.

Based on these observations, two methods are used to measure permanent income. First, permanent income can be predicted by an equation estimated with total household income as the dependent variable. Second, it can also be predicted by an equation estimated on agricultural income alone. In addition, it might be useful to treat the observed agricultural and non-agricultural income as equally important and investigate their effects on wealth accumulation.

Table 3 shows the preliminary results in the estimation of two permanent income equations with total income and agricultural income as the dependent variables, respectively. Weighted least squares are used in the estimation. The coefficients of age, age squared, and schooling of the household head show the expected signs and are highly significant. Each additional year of schooling will increase the household annual income by 33 yuan, which is lower than the return from schooling for urban households. Each additional worker would raise the household annual income by 381 yuan. If the head is employed in the secondary or service sectors, the total household income will increase while the agricultural income will fall. ACT2 and ACT3 are dummies with a value of one if the household's income from manufacture and other activities is non-zero. They do not have a significant effect on total income but negatively affect agricultural income. This suggests that

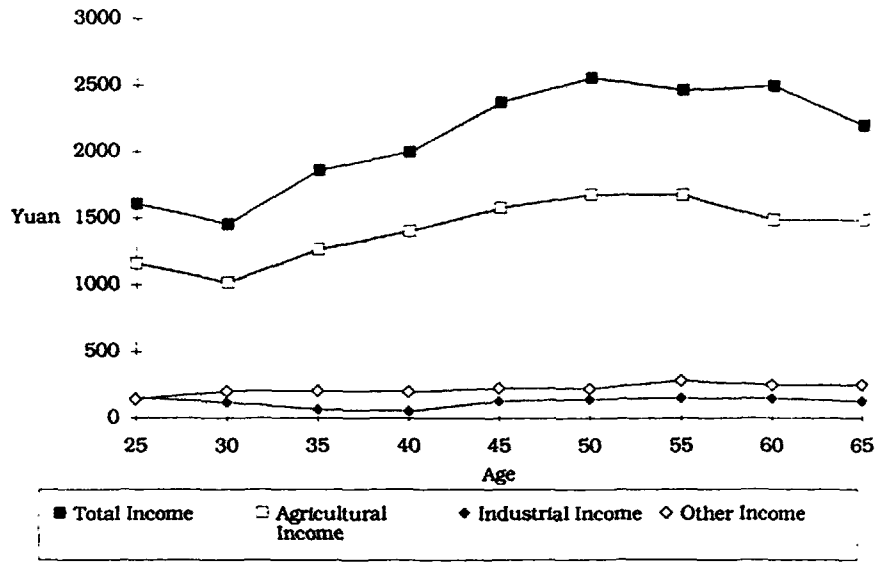
diversification among agricultural and non-agricultural activities may not necessarily lead to increases in total income, but will change the composition and reduce the uncertainty of income. Households located in coastal provinces have significantly higher income while the income of households located in poor regions is lower, as expected. DISTANCE denotes the distance in kilometers from the household's residence to the county town. It can be used as a proxy for the accessibility to market, information, and other resources. It has a negative effect on total income, suggesting that the further away the household is from the county town, the lower its total income. Overall, the two equations are estimated with less precision than those for urban households, which is not surprising, given the larger variations in rural household income.

Table 3
Estimated Permanent Income Equations
for Rural Households

Variable*	INC	t	AGINC	t
CONSTANT	-1827.06	-5.0	-809.93	-3.3
AGE	110.01	6.5	73.85	6.6
AGESQ	-1.17	-6.1	-0.85	-6.6
SCHL	32.89	4.5	14.62	3.0
NUMBWK	381.15	19.5	267.77	20.5
SECOND	126.86	1.5	-362.45	-6.5
SERVICE	584.01	6.2	-325.70	-5.1
ACT2	86.91	1.4	-194.01	-4.9
ACT3	61.84	1.3	-190.10	-6.3
COAST	818.73	13.7	313.22	7.9
POORREG	-82.40	-1.6	-140.46	-4.1
DISTANCE	-1.78	-1.8	0.70	1.1
Adj. R^2	0.2147		0.1789	

* See Appendix for a description of variables.

Figure 8: Household Income and Composition for Rural Households (in 1986 yuan)



5. Estimation of Wealth Equations

This section presents the preliminary results in the estimation of wealth equations and in hypothesis testing.

5.1 Estimated wealth equations for urban households

Two sets of wealth models are presented here, namely, $W = f(Y^P)$ and $W = f(Y^P, Y^T)$, with only two measures for permanent income: estimated Y^P based on total income equation, and

observed wage and bonus.[10] The four wealth equations are specified as follows:

Model 1:
WEALTH = F
(PYINC, AGE, FORCED, INC350)
Model 2:
WEALTH = F
(PYINC, TRANSINC, AGE, FORCED, INC350)
Model 3:
WEALTH = F
(WAGE, BONUS, AGE, FORCED, INC350)
Model 4:
WEALTH = F
(WAGE, BONUS, OTHINC, AGE, FORCED, INC350

PYINC is the predicted annual permanent income based on the total income equation, and TRANSINC is the residual between total income and PYINC.[11] WAGE, BONUS, and OTHINC are three components of the observed income. AGE is the age of the household head representing the number of years the household has been cumulating its wealth. INC350 is an income spline variable used in order to catch the kinked effect of income on wealth accumulation. It equals zero if the per capita income of the household is less than 350 yuan (chosen as the poverty line), and is positive otherwise.[12] The underlying hypothesis here is that households living below the poverty line have different saving behavior than better-off households in a way that the slope coefficient of income in wealth equations changes at a level of 350 yuan per capita. FORCED is a dummy variable that equals one if the respondents claimed that part of the saving is involuntary (owing to the unavailability of desired consumer durables, etc.), and zero otherwise. Of the urban sample, 32.3% claimed to have involuntary saving because the supply of

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[10] Wealth equations using another measure of permanent income estimated on wage and bonus are not presented since estimated coefficients do not differ much from Model 1 (using PYINC).

[11] Hausman's specification test (Hausman, 1987) is conducted. See Section 5.3 for the results of the specification test.

[12] INC350 is defined as: INC350 = Max { 0, INC - (350*HHSIZE) }. It equals zero if the household income, INC, is less than or equal to 350 yuan per person. Otherwise, it equals the difference between household income and the poverty line, INC - (350*HHSIZE). Here, the poverty line is assumed to be 350 yuan per capita for urban residents, which is close to 50% of the urban average per capita income in 1985 (342 yuan).

consumer durables was not as abundant as today and the quality was low in 1986. Hence, this variable is included to see if it affects the amount and composition of household wealth.

Table 4 shows the preliminary results of the estimated wealth equations for urban households, Model 1 through Model 4. The coefficients of PYINC in both Model 1 and Model 2 are positive and significant, indicating that as permanent income rises by one yuan, the household cumulated wealth over time increases by 0.65 yuan in Model 1 and 0.47 yuan in Model 2. In other words, the marginal propensity to cumulate wealth (MPCW) from PYINC is about 0.65. This, however, is only for poor households with per capita income below 350 yuan. Since the coefficient for INC350 is positive and significant, the MPCW for better-off households would be about 1.38 (the summation of 0.65 and 0.73) in Model 1 and 1.43 in Model 2. The coefficient for transitory income, TRANSINC, is not significantly different from zero in Model 2. This result is consistent with the permanent income hypothesis (PIH) and findings of other studies. In strict PIH, all transitory income should be saved with MPS from transitory income equal to one. Other studies often found that MPS from transitory income is greater than MPS from permanent income. However, since transitory income should have a mean of zero over time, it should have no effect on the cumulated wealth (i.e., the positive effect cancels out with the negative effect over time). In Model 3 and Model 4, both WAGE and BONUS are positive and significant, as expected. OTHINC has a negative effect on wealth since it includes hardship allowance. Hence, the recipients of OTHINC are mostly low income households, and they cumulate less wealth over time.

The dummy variable for involuntary saving, FORCED, has positive and significant effects on wealth, and it shows consistently in all models. This implies that involuntary saving still existed in 1986, and its effects on total wealth and composition of wealth should not be ignored. In Table 5, FORCED has larger and more significant coefficients in equations for financial assets than in equations for durables, suggesting that households do tend to cumulate financial assets when desired consumer durables are not available. Coefficients for the income spline variable, INC350, are consistently positive and significant across all four models, indicating that better-off households do cumulate substantially more wealth over time than households living below the poverty line. The wealth/income curve does have a kink: the slope of the curve becomes steeper at an income level of 350 yuan per capita. However, one should not exclude the possibility of a continuous change in the slope of the curve. Therefore, a model with a quadratic form (PYINC squared) was attempted. This model was estimated with much less precision (insignificant coefficients and low R^2) than the present models,

and hence was not used. The unexpected insignificant coefficients for AGE in Models 1 and 2 can be explained by canceling out positive and negative effects of age on different components of wealth (shown in Table 5). Comparing all four models, Model 1 can be considered the simplest because it has the least number of variables and hence the best. No conclusion can be reached though, since no rigorous statistical test is conducted on model comparison.

Table 5 presents two sets of estimated equations for financial assets and value of durables using Models 1 and 3. The results are very similar to those for total wealth equations. The most interesting difference is in the coefficients for age variables. In both equations for financial assets, age has positive and significant coefficients, indicating that the amount of financial assets increases as people age. However, age has a negative and significant effect on the value of durables, meaning that older households hold much less of their wealth in the form of durables than younger households. This is consistent with what we saw in Figure 1 in Section 3.3. Although no rigorous model on portfolio decision is built, this finding gives us some idea about different portfolio preferences for different age groups. This type of portfolio preference can be explained by man factors: younger cohorts may be affected by the "model effect of consumption" and inflation expectations, and hence consumer durables are more attractive. Older cohorts have to save for their retirement, and liquidity is more important. Moreover, for the older generation, the benefit from time-saving consumer durables is less, since time is not as scarce for the old as it is for the young.

Table 4
Estimated Wealth Equations for Urban Households:
Model 1 to Model 4

Variable*	Model 1 WEALTH	Model 2 WEALTH	Model 3 WEALTH	Model 4 WEALTH
CONSTANT	845.97	977.55	1264.36	1550.27
t	(3.1)	(3.4)	(4.9)	(6.0)
PYINC	0.65	0.47		
t	(7.8)	(3.0)		
TRANSINC		-0.23		
t		(-1.4)		
WAGE			0.47	0.13
t			(7.6)	(2.0)
BONUS			0.28	0.22
t			(3.7)	(3.0)
OTHINC				-0.98
t				(-11.4)
AGE	0.87	1.14	17.49	14.66
t	(0.12)	(0.2)	(2.8)	(2.3)
FORCED	1164.0	1153.3	1129.5	1087.3
t	(9.9)	(9.8)	(9.7)	(9.5)
INC350	0.73	0.96	0.63	1.12
t	(18.3)	(5.6)	(14.3)	(18.4)
Adj. R^2	0.1872	0.1874	0.1899	0.2160

*See Appedix for a description of variables.

Table 5
Estimated Equations for Financial Assets and Value of Durables:
Urban Households: Model 1 and 3

Variable*	Financial Assets		Value of Durables	
	Model 1	Model 3	Model 1	Model 3
CONSTANT	-580.24	-414.96	1426.22	1679.32
t	(-2.9)	(-2.1)	(9.3)	(11.3)
PYINC	0.27		0.38	
t	(4.4)		(8.1)	
WAGE		0.19		0.28
t		(4.1)		(8.0)
BONUS		0.17		0.11
t		(3.0)		(2.6)
AGE	17.13	24.16	-16.27	-6.66
t	(3.2)	(5.1)	(-3.9)	(-1.8)
FORCED	939.58	924.09	224.44	205.43
t	(10.9)	(10.7)	(3.4)	(3.1)
INC350	0.40	0.35	0.33	0.28
t	(13.5)	(10.7)	(14.7)	(11.2)
Adj. R^2	0.1286	0.1304	0.1149	0.1164

* See Appendix for a description of variables.

5.2 *Estimated wealth equations for rural households*

For rural households, I present three types of permanent income model, namely, $W = f(Y^P)$, $W = f(Y^P, Y^{P2})$ and $W = f(Y^P, Y^T)$, and a model with decomposed current income. They are specified empirically as follows:

Model 1:
WEALTH = F
(PYINC, AGE, DEPENDR, INC200, DISTANCE)
Model 2:
WEALTH = F
(PYINC, PYINCSQ, AGE, DEPENDR, INC200, DISTANCE)
Model 3:
WEALTH = F
(PAGINC, TRANSIN2, AGE, DEPENDR, INC200, DISTANCE)
Model 4:
WEALTH = F
(AGINC, NAGINC, AGE, DEPENDR, INC200, DISTANCE)

PYINC is the permanent income estimated from total household income, and PYINCSQ is its squared term.[13] PAGINC is the permanent income estimated from agricultural income alone, and TRANSIN2 is the residual between total income and PAGINC. AGINC and NAGINC are observed agricultural and non-agricultural income, respectively. DEPENDR is the dependency ratio defined by the ratio of the number of persons and the number of workers in a household, and it varies from one to eight in this sample. It is included here because children's marriage is one of the most important motivations for saving in rural areas. INC200 is an income spline variable defined in the same way as INC350, with the poverty line chosen at 200 yuan per capita (the State Council poverty line for rural areas in 1985). DISTANCE denotes the distance in kilometers from the household's residence to the county town. It is a proxy for the accessibility to market, investment opportunities, information, and other resources. It affects saving not only indirectly through income, but also directly through investment opportunity and the "model effect of consumption."

Table 6 presents the preliminary results of the estimated wealth equations. The coefficient of PYINC in Model 1 is positive and highly significant, and its magnitude is much bigger than that for urban households. Ceteris paribus, if permanent income rises by 1 yuan, an urban (poor) household would have 0.65 yuan cumulated wealth over time, while a rural (poor) household would have 1.38 yuan cumulated wealth. Again, this is for poor

[13] See Section 5.3 for the results of Hausman's specification test.

households only. For better-off households, the marginal propensity to cumulate wealth (MPCW) could be as high as 2.37, since the coefficient of INC200 is .99 and highly significant. The higher MPCW for rural households can be explained by different circumstances, such as more uncertainty in income and more opportunities to invest for rural households. It is also due to the inclusion of housing value in rural wealth. Neglecting the value of housing, the MPCW for rural households would be lower than for urban households, as shown in Table 7. For financial assets, the coefficient of PYINC is 0.21 for rural and 0.27 for urban households. The same coefficients for value of durables are 0.28 and 0.38, respectively. This suggests that rural households are much more vulnerable than urban households to an exogenous income shock.[14]

When a quadratic form is used in Model 2, the coefficient of PYINC becomes non-significant and that of PYINCSQ is positive and significant. The latter suggests that the wealth/income curve might be a non-linear, upward sloping, and convexed curve. When we use the permanent income estimate based on agricultural income alone, PAGINC, the coefficient becomes larger than that of PYINC, as expected. However, if observed agricultural and non-agricultural income are used, the coefficients become smaller, which suggest there may be measurement errors in these variables.

AGE does not have significant effects except in Model 4 and in the equation for the value of housing in Table 7. This may be explained by the fact that the living standards of rural households has been greatly improved since the reform in 1978, so age (i.e., the number of years prior to 1978) does not matter much. The coefficients for DEPENDR are consistently positive and significant, which suggests that children's positive effect on wealth might be dominating the negative effect through consumption. Intuitively, one has to cumulate more wealth over time for precautionary and other reasons if one has more dependents. Note in Table 7, DEPENDR has a positive and significant effect on the value of durables because the per capita opportunity cost of durables is lower for a larger household. The income spline variable, INC200, has positive and highly significant coefficients and the magnitude does not vary much across four models, suggesting that poor households do cumulate

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[14] When comparing the living standard and vulnerability of rural and urban households, one should exclude the value of rural housing since urban households have access to subsidized housing. However, when comparing the wealth accumulation behavior, one should not exclude the value of housing and deny the fact that rural households do tend to add more to their total wealth out of permanent income than urban counterparts.

less wealth than better-off households. In Table 7, the coefficient of INC200 in the equation for value of housing is substantially higher than those in the other two equations, suggesting that better-off rural households invest a larger proportion of their permanent income in housing than in other assets. This has worrisome implications of agricultural development because little investment is made on non-privately owned land; data is, however, limited and there is therefore no hard evidence. The distance to county town has negative effects on wealth, presumably because of the lack of access to information and investment opportunities.

Overall, the wealth equations for rural households are estimated with less precision than those for urban households, with only 11 to 12% of the variations in wealth explained. This is not surprising because of the greater deviation of production conditions, household income, and household wealth in rural areas. In a comparison of all four models, the estimated coefficients are, in most cases, insensitive to different measurements of variables and model specifications, which gives us more confidence in these results. Model 1 might be considered the best among the four models because it has the least number of regressors, although no conclusion can be drawn without a statistical test.

Table 6
Estimated Wealth Equations for Rural Households:
Model 1 to Model 4

Variable *	Model 1 WEALTH	Model 2 WEALTH	Model 3 WEALTH	Model 4 WEALTH
CONSTANT	-721.81	862.02	-794.08	1253.10
t	(-1.3)	(1.0)	(-1.3)	(2.4)
PYINC	1.38	-0.08		
t	(9.1)	(-0.1)		
PYINCSQ		0.0003		
t		(2.2)		
PAGINC			1.55	
t			(6.4)	
TRANSIN2			1.31	
t			(4.3)	
AGINC				0.45
t				(4.3)
NAGINC				0.83
t				(5.6)
AGE	1.73	4.10	10.88	25.45
t	(0.2)	(0.4)	(1.2)	(2.8)
DEPENDR	543.63	522.92	558.84	168.53
t	(4.0)	(3.8)	(4.0)	(1.3)
INC200	0.99	0.98	1.06	0.91
t	(15.0)	(14.7)	(16.2)	(11.5)
DISTANCE	-9.75	-10.05	-14.26	-13.85
t	(-2.6)	(-2.6)	(-3.7)	(-3.6)
Adj. R^2	0.1221	0.1231	0.1154	0.1114

* See Appendix for a description of variables.

Table 7
Estimated Equations for Components of Wealth:
Rural Households: Model 1

Variable*	Financial Assets	Value of Durables & Tools	Value of Housing
CONSTANT	311.07	-571.28	-461.60
t	(0.9)	(-2.5)	(-1.4)
PYINC	0.21	0.28	0.89
t	(2.3)	(4.5)	(10.3)
AGE	-6.51	3.64	4.60
t	(-1.2)	(1.0)	(4.0)
DEPENDR	15.95	214.86	312.82
t	(0.2)	(3.9)	(0.9)
INC200	0.27	0.29	0.43
t	(6.7)	(10.7)	(11.4)
DISTANCE	-3.47	-1.07	-5.21
t	(-1.5)	(-0.7)	(-2.4)
Adj. R^2	0.0192	0.0532	0.1025

* See Appendix for a description of variables

5.3 Hypothesis testing

In order to test Null Hypothesis I concerning the effects of permanent income, Hausman's specification test (Hausman, 1978) is conducted to compare two regressors: estimated permanent income, PYINC, and current income, INC. The purpose is to make sure that the use of PYINC in wealth equations will not cause specification error. The test is conducted for both urban and rural samples. For the urban sample, I included both PYINC and INC and re-estimated Models 1 and 2 for total wealth, financial assets, and value of durables separately. In all the equations, the coefficients of PYINC are significantly different from zero, with the t statistics ranging from 7.8 to 4.5. In contrast, the coefficients of INC are not significant in all equations, with t ranging from -0.9 to -1.3. This suggests that there might be measurement errors in the current income variable INC and that the "true" regressor should be the estimated permanent income PYINC.

For the rural sample, I included both PYINC and INC in Model 1 and re-estimated the equations for total wealth, financial wealth, value of durables, and value of housing. The coefficients of PYINC are significantly different from zero in three out of four equations, with the t statistics of 6.2 in wealth, 6.9 in housing, 3.8 in durables, and 1.1 in financial assets. The coefficients of INC are significant in only two equations, with the t of 1.98 in wealth, and 2.3 in housing. This implies that permanent income estimates based on total income, PYINC, dominates current income, INC, and should be the true regressor.

In summary, Null Hypothesis I concerning permanent income is strongly rejected: variations in wealth can be explained by permanent income at least as well as current income, if not better. This result may be challenged by the presence of the borrowing constraint in China. However, the borrowing constraint might not be binding over a household's lifetime. Young adults do not need to borrow, because they usually do not leave their parents until they get married. Older households can use their cumulated savings to maintain the consumption level after retirement (in urban areas) or rely on their children. They do not need to borrow either. Households can still make consumption and saving decisions based on their lifetime resources (permanent income), even if they cannot borrow. Moreover, since the household income has been stable and smoothed (at least for urban households), it is easier for them to predict the permanent income based on current income(or wage and bonus) than households in other countries. Therefore, the rejection of Null Hypothesis I should not be a surprise.

Null Hypothesis II concerning the behavior of poor households is rejected since the coefficients of income spline variables are positive and highly significant across all models

for urban and rural households. This implies, ceteris paribus, that households living below the poverty line have a lower marginal propensity to cumulate wealth than better-off households.

Null Hypothesis III concerns the dissaving behavior of older households. Although no rigorous statistical test is conducted, the descriptive analysis does provide some evidence that older households dissave to maintain their consumption level. In Figures 2, 3, 5, and 6, wealth and savings show a clear "hump" shape over different age groups, with the dissaving behavior appearing after age sixty.

Null Hypothesis IV is about the effect of different occupations. There is strong evidence that rural households do have a higher marginal propensity to cumulate wealth, if the value of housing is included in wealth. However, since no information is provided on urban housing, and an insufficient number of urban households are employed in the private sector, I am unable to test the hypothesis rigorously.

6. Comparison

6.1 A study on American household saving

The above results can be compared with a similar cross-sectional analysis conducted on American household saving behavior (Wang 1989). The United States has experienced a period of low and declining rates of saving since the mid-1970s. The study investigated the relationships between the price of time (the reservation wage rate) and savings of mature and stable American households in 1983/1986. It developed a life-cycle consistent model of saving in which work/leisure and consumption/saving are simultaneously determined under an uncertain lifetime with a bequest motive. Surveys of consumer finances (1983 and 1986 waves) and the instrumental variable procedures are used in the empirical analysis.

Major findings of this study include first, the shadow price of time, or reservation wage rate, is positively related to the number of hours worked, and it shows an inverse U shape over an individual's life-cycle. Second, the current price of time and lifetime labor and leisure wealth are important determinants of household savings, defined as the changes in household non-human wealth between 1983 and 1986. Savings and leisure are found to be net and gross complements. A 1% increase in the reservation wage rate would depress savings by 2 to 3%. Third, household saving is found to be negatively related to housing prices. The large increases in housing prices during 1983 and 1986 (10.29%) may have accounted for a substantial proportion of

decline in the saving rates. Fourth, demographic characteristics of the household -- such as age of the head, education, number of children, and age of the youngest child -- have significant effects on savings. Moreover, these findings are insensitive to alternative measures of independent variables.

In a time series analysis, Bryant and Wang (1990) found that increases in the price of time (especially the female's price of time) contributed to the large increases in Americans' demands for services and consumer durables relative to non-durables during the 1955 to 1984 period. Combining the findings of Wang (1989) and Bryant and Wang (1990), one may draw the following inferences: one possible reason for the decline of Americans' saving rate is that the price of time (or reservation wage rate) has been increasing in the last two decades or so. As time becomes more and more expensive, Americans are spending more time working and purchasing more time-saving goods and services, such as automobiles, microwave ovens, washing machines, other consumer durables, and child-care and restaurant services, etc. On average, their marginal propensities to consume increase and they save less. Intuitively, consumer durables and services have become substitutes for female time in household activities. Another reason might be that the increases in the prices of housing and other real estate assets, which appreciated the nominal value of household non-human wealth, made households feel more secure and hence induced them to save less.

6.2 Money-saving and time-saving behavior

Comparing the findings of this study and studies on American household saving behavior, one may find many similarities such as the "hump" shaped age profile of wealth and savings and many differences in the composition of savings and so forth. Here, I only discuss one major difference, namely, the difference between "money-saving" and "time-saving" behavior.

According to my observations, the price of time is not as important a determinant in Chinese savings as it is in American savings, although no hard evidence can be provided owing to the lack of data. The reason is that the labor market is very rudimental and is segmented in China. High earning opportunities are not easily accessible to individuals since there are many restrictions on "moonlighting," on job changing, and especially on rural-urban migration. An individual's earning ability is limited by the kind of job he/she was assigned to (in urban areas) or the area he/she was born in (in rural areas). Under these circumstances, individuals and households would take the income as given, and spend a lot of time searching for lower prices in order to save money penny by penny. Hence, Chinese household behavior can be characterized as "money-saving" behavior. In a country where the labor market is more

developed, such as the United States, individuals and households tend to spend more money on time-saving goods and services in order to obtain higher earning opportunities. Their saving may decline as time becomes more and more expensive, but their allocation of time becomes more efficient. This kind of behavior may be characterized as "time-saving" behavior.

The difference between "money-saving" and "time-saving" behavior is related to the efficiency of labor markets and capital markets, and certainly has some implications for labor productivity and economic growth. The question as to whether "time-saving" behavior is good or bad is not within the scope of this paper. However, it reminds us that saving or wealth accumulation should have two dimensions -- human (time) and non-human (monetary and physical) resources. A comprehensive study on saving and wealth should include both dimensions. After all, economic growth is about how to allocate resources, both human and non-human, more efficiently. Therefore, when we analyze the effect of savings on economic development, we should not ignore the investment and utilization of human capital, which is at least as important as savings in non-human forms. Previous literature on savings focused only on savings in non-human forms. This failed to identify necessary and sufficient conditions for sustained growth. As evidenced by the last thirty years of Chinese experience, a persistent high rate of saving may not be sufficient for sustained growth. One of the key factors here is whether the savings in physical capital forms are accompanied by an efficient allocation of human resources, or by savings in human capital forms, namely, savings of time.

7. Conclusion

This study can be considered a useful exercise in applying life-cycle/permanent income models to Chinese household survey data. It provides some insights on the determinants of income and wealth accumulation, and on age profiles of household income, savings, total wealth, and composition of wealth in China. The results show that the variations in wealth can be explained by permanent income at least as well as current income. Ceteris paribus, households with income below the poverty line cumulate a substantially smaller amount of wealth than better-off households. Rural households with highly uncertain income cumulate more wealth than urban households with the value of housing taken into account. This does not imply that rural households are more resistant to an income shock. On the contrary, descriptive statistics show that rural households are more vulnerable on a per capita basis than urban households. Because of the data limitations, these results can only apply to mature households in surveyed provinces and should not be

generalized to the entire population. However, the estimated coefficients are insensitive to different measurement and model specifications. Moreover, the findings are consistent with life-cycle/permanent income theory and findings of studies for other developing countries.

This study also sheds light on the trend of household savings in China. The average propensity to cumulate wealth will continue to rise provided that economic reform continues to improve allocative efficiency, that more households are lifted out of absolute and relative poverty, and that more employment and investment opportunities become available. The rate of saving is likely to move upward, although no hard evidence can be provided because of limitations of data. On the other hand, one should be concerned about the patterns of investment by Chinese households: investment away from land (in rural areas) and from housing (in urban areas) may have adverse effects on long-term economic development. This biased investment pattern may be modified if property rights can be clearly defined and the market for real estate is allowed to develop. Given that this is only a preliminary analysis, much work needs to be done in exploring different theoretical models or function forms, in solving measurement problems, and in making comparisons with studies of other developing countries.

The comparison between "money-saving" and "time-saving" behavior provides policy implications for the mobilization of domestic resources in developing countries. Since saving and wealth accumulation have two dimensions, human and non-human, a long-run development policy should not be directed toward mobilizing savings in non-human forms only. Rather, it should be designed to encourage the investment and accumulation of both human and non-human resources, and to improve the allocative efficiency of labor and capital markets in general. This should include, for example, how to make higher earning opportunities and investment opportunities accessible to rural and urban households, how to increase their earning potential (and hence, permanent income) through investment in human capital, and how to mobilize and allocate both human and non-human resources more efficiently.

Appendix
Description of Variables used in Regression

Variables	Descriptions
MINCOME	Monthly total income of the urban household.
MWAGEB	Monthly total wage and bonus of the urban household.
AGE	Age of the household head in years.
AGESQ	=AGE*AGE
SCHL	Number of years of schooling for the household head.
NUMBWK	Number of household members employed.
COLLECT	=1 if the head is employed in collective sector, 0 otherwise.
PRIVATE	=1 if the head is employed in private sector, 0 otherwise.
JOINTV	=1 if the head is employed in joint-venture, 0 otherwise.
OTHOWN	=1 if the head is working for other type of employer, 0 otherwise.
TECH	=1 if the head is technical or professional personnel, 0 otherwise.
MANAGER	=1 if the head is managerial or office personnel, 0 otherwise.
SERVWK	=1 if the head is commercial or service personnel, 0 otherwise.
NOCLASS	=1 if the head's occupation is not easily classified, 0 otherwise.
DISAB	=1 if the head is disabled or unemployed, 0 otherwise.
COAST	=1 if the household lives in a coastal province, 0 otherwise.
POORREG	=1 if the household lives in a poor province, 0 otherwise.
INC	Annual total income from all sources of the household.
AGINC	Annual total income from farming, forestry, animal husbandry, fishing, handicrafts, and gathering and hunting.
SECOND	=1 if the head is employed in secondary sector, 0 otherwise.
SERVICE	=1 if the head is employed in service sector, 0 otherwise.
ACT2	=1 if the household's income from manufacturing and construction is non-zero, 0 otherwise.
ACT3	=1 if the household's income from other activities is non-zero, 0 otherwise.
DISTANCE	The distance between the household's residence to the county town in kilometers.
WEALTH	Total household wealth including financial assets and value of durables (for urban) and value of farm tools and housing (for rural household).
FIN ASSET	Total financial assets at the end of 1986, including cash, bank deposits, and government bonds.

Variables	Descriptions
VDURABLE	Total value of durables (in current yuan), including items such as TV, refrigerator, washing machine. For rural household, it also includes value of farm tools.
VHOUS	Value of private housing, in current prices.
PYINC	Predicted permanent income estimated based on total income for the household.
TRANSINC	Difference between the total household income and predicted permanent income.
PYINCSQ	=PYINC * PYINC.
WAGE	Annual total wage income of the household.
BONUS	Annual total bonus income of the household.
OTHINC	Annual irregular income including royalties, rewards, and hardship allowance.
FORCED	=1 if the household claimed that part of the savings is involuntary, due to unavailability of desired consumer durables.
INC350	= Max [0, INC - (350 yuan * HHSIZE)] where
HHSIZE	Number of persons in the household.
PAGINC	Predicted permanent income estimated based on agricultural income alone.
TRANSIN2	Difference between the total income and predicted agricultural income, PAGINC.
NAGINC	Observed non-agricultural income for the household.
DEPENDR	Ratio of number of persons in the household and number of workers in the household.
INC200	= Max [0, INC - (200 yuan * HHSIZE)]

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Robert S. McNamara Fellowships Program

1. Background

When the Executive Directors of the World Bank passed a resolution establishing the McNamara Fellowships Program in 1982, they wrote that the intent of the program was "to promote imaginative and innovative research on issues related to economic development." Throughout the soon-to-be ten years of the Program's history, this has remained its main purpose. Eight World Bank member countries expressed their support for this idea in a practical way: together with the World Bank, the Governments of Bangladesh, China, India, Kuwait, Nigeria, Pakistan, Peru and Yugoslavia made the financial contributions which paved the way for the Program to be launched, and for the first Fellows to be selected in the spring of 1983. It is the interest from the endowment fund set up with their financing that provides the money for the Fellowships.

The Program has changed very little since its inception. Approximately the same number of Fellowships, i.e. around ten, is awarded each year, and although interpretation of the objectives has sometimes varied, the basic eligibility criteria remain the same. McNamara Fellowships are awarded to nationals of World Bank member countries. In 1982 this meant nationals from 139 countries were eligible to apply. Since then sixteen more countries have joined, thus increasing the Program's potential clientele, as well as its chances of attaining the geographic diversity which is an integral objective.

The academic requirement for McNamara Fellows is a minimum of a Master's degree or equivalent. In reality, in recent years, most of those awarded Fellowships have already received their doctorates. There are a number of reasons for this: the McNamara Fellowships Program specifically states that it will not provide funding for studies leading to an academic degree, but most young academics today are eager to acquire the highest possible degree in preparation for a competitive world. The result is that many of those who apply with Master's degrees are already enrolled in a doctoral program. However, to avoid any possible

conflict with the policy statement outlined above, the Program stipulates that all studies must have been completed and the doctoral degree conferred before recipients may be allowed to take up their Fellowships. In addition, applicants who already have doctorates invariably have more research experience and an established field of research. Given the short length of the Fellowship, twelve months, and the difficulty of producing significant results in that time, an experiential headstart is considered an asset. In connection with this, applicants who have already begun research in a given area usually also have the necessary field contacts, an additional time-saving aspect.

A third eligibility criterion, in addition to the nationality and academic requirement criteria, is that Fellows must spend their Fellowship year at a host institution in a World Bank member country other than their own. The original purpose of this was to expose Fellows to cross-cultural experience. Nowadays, however, very few of the applicants have not already had this experience. The advantage of such a criterion is that Fellows from the developing world have the opportunity to learn from developed countries and return home with new knowledge and a chance to find solutions to problems, whereas Fellows from the developed countries have the opportunity to experience at first hand the problems of the developing world with, of course, the same chance to formulate solutions. The question of accountability has been raised in recent years, and Fellows are currently being asked to provide the name of an adviser at the host institution. This is more easily provided if the applicant has already had experience with the institution and knows the staff. Although the host institutions are usually academic, they need not be, and in the past, Fellows have carried out their research with NGOs and in the private sector.

The final general eligibility criterion is that of age. The Board resolution states that Fellows should normally be thirty-five years of age or less. In a breakdown of the ages of the thirty-three finalists for the 1991 Fellowships, five were between twenty-six and thirty, nineteen were between thirty-one and thirty-five and nine were between thirty-six and thirty-eight. In the final distribution of awards, two of the five in the youngest group (40%), five of the nineteen in the middle group (26.3%), and three of the nine in the oldest group (33.3%) were awarded Fellowships. Three reserve candidates also came from the middle age group. There has been a flexible interpretation of the age criterion in the past few years, which has possibly come about as a result of the increased number of post-doctoral applicants. However, no-one over thirty-nine has ever been awarded a Fellowship.

Given the above criteria, and the ways in which they have been interpreted over the years, it is hardly surprising to note that the majority of the Fellows being selected are academics. A

total of forty-one former and current Fellows (1983-1990) responded to a questionnaire sent out by the Program asking for up-to-date information. Of these forty-one, twenty-six are currently in academia, with the remaining fifteen either in NGOs, government service or the private sector. It should be noted, however, that the McNamara Fellowships Program is indeed also intended to provide mid-career government officials with an opportunity to take a year's sabbatical and pursue research of personal interest, and there have always been a number of Fellows in this category. The target population of the McNamara Fellowships Program is therefore a double one: young academics, who are starting out on a career in research and for whom the McNamara Fellowship provides a chance to pursue research interests uninterrupted by teaching, and mid-career officials who are given a chance to expand horizons. It is also hoped that the research results provided by both groups of Fellows will foster progress in the field of economic development.

The area of research under the Program has never been more fully defined than "fields related to economic development." As a result, the Program has always received applications on a wide variety of topics: land management, labor markets, medical ecology, structural adjustment, environmental law and exchange rate reform, to name but a few. Although all of the topics usually fell within the overall general area specified, it was extremely difficult to judge the merits of one subject as opposed to another, and in an attempt to rectify this, the Program began setting priority topics for a particular year. Priority topics for 1991 Fellows included poverty alleviation, and development issues for women. Although this was helpful to an extent, it was not entirely satisfactory, and so once again areas of research have been opened up. Nevertheless, for the upcoming anniversary cycle proposals with implications for public policy are being encouraged.

2.The Fellowships

McNamara Fellowships are tenable for a period of twelve months and are not renewable. This is not long by research standards, but is in keeping with the idea of the Program as an opportunity for young academics to build a research career, or for mid-career officials to enjoy a sabbatical year. With this time limitation, it is clear that any application must contain a proposal that is viable, and can produce the expected results within the given timeframe.

The amount of money available for Fellowships has not varied substantially over the years, and neither has the amount of the Fellowships themselves. Currently there is a minimum award of $25,000. Applicants who request the minimum need not itemize their budgets, but the amount is expected to cover the

economy-class travel to and from the host institution for the Fellow, accommodation and subsistence for the year, and research expenses, which might include computer software, literature, car rental or language services. This amount, once accepted, will not be increased. In addition, Fellows with families are entitled to apply for an additional allowance of $5,000, which remains the same regardless of the size of the family, and is only available if the family members are accompanying the Fellows to the host institution for six months or longer. In some cases, the minimum budget may not be sufficient, and applicants may request up to $40,000, inclusive of the family allowance. In this case, applicants are expected to give detailed estimates of the costs attached to each budget category. The host institution is expected to provide office space and access to a computer for any data analysis. In some cases it may also make secretarial support available. The World Bank provides health and insurance coverage for the Fellows and their families for the time spent in the host country.

The Program acknowledges that Fellows may have other financial commitments during the Fellowship year and does not therefore reject the possibility of the Fellow receiving funds from other sources. The caveat is, however, that the McNamara Fellowships Program must have first rights to publish the results of the year's work.

Fellows are expected to produce quarterly progress reports and, at the end of the year, a report containing the results of the research. This report is circulated to World Bank staff for comment, and a decision is then taken on whether or not to publish the results in the Program's own series. In the past this process has led to only a few of the final reports being published, in part because of the research itself and in part because of a breakdown in the reviewing process. This is regrettable, since the dissemination of the research results is, of course, basic to the Program. Steps are currently being taken to change this, and it is hoped that in the future there will be greater emphasis placed on this stage of the Program. In addition to publishing the results of their research, the Program encourages cooperation with World Bank staff and plans to invite outstanding Fellows to give talks to Bank staff.

3. Announcement and Selection Procedures

The cycle begins each year at the end of April-beginning of May with announcements being sent to academic institutions and research institutions in member countries. All World Bank Executive Directors' Offices and Resident Missions receive information and application forms, as do Economic Development Institute (EDI) partner institutions. There is also an announcement in *The Economist.* Requests for information

about the Program from individuals, either by letter or by telephone, average about 120 per week at this stage. At one point the Program was advertising widely, and, it was felt, indiscriminately. This has since been changed, partly to target the correct population and partly to improve the applicants' chances of receiving an award. Application forms are no longer automatically sent out to academic institutions on the mailing list, and are only sent to those individuals making inquiries who are clearly eligible to apply. Those who make general inquiries about the Program receive the Information Sheet and are invited to request application forms if they meet the basic criteria. This change in procedures has been made in an attempt to prevent time being spent unproductively at the screening stage.

For the first time in the history of the Program the deadline for the receipt of completed applications has been changed; they must now be in the Program office by December 31, instead of November 1. This is to allow applicants more time to complete the forms and acquire all the documentation needed. Further changes in the screening process also mean that less time will now be needed between receipt of the applications and final selection of the Fellows in March. The initial screening process is carried out by the Program Secretariat. At this stage each applicant is screened to ensure that he or she meets all the basic criteria, and that the documentation needed to assess the application has been received with the forms. Central to this documentation is a three-page proposal outlining the research to be carried out if the applicant is awarded a Fellowship. The proposals of all eligible applicants are then read through before a first cut is made. After the first cut, the remaining proposals, or semi-finalists, are sent to a group of three experts who read and rank them. A second cut based on their combined ratings produces a group of finalists, whose proposals and applications are forwarded to the Selection Panel for a final decision at their annual meeting in March. The Selection Panel is composed of Executive Directors of the World Bank and distinguished academics from around the world, and is chaired by a senior World Bank staff member.

4. The Direction

One of the questions in the questionnaire sent to former and current Fellows this spring was, "In what ways do you feel the McNamara Fellowship has helped you in your professional career?" With very few exceptions the Fellows said how much they felt they had benefited from the chance to spend an entire year on one research project, and had appreciated the chance to learn about the problems of economic development in greater depth. In some cases it has provided an opportunity to widen the scope of ongoing research; for example, expanding a local research project

on the machine tool industry into a comparative one, or moving out of an academic context into a grass roots situation on deforestation. In other cases, being a McNamara Fellow has greatly enhanced personal career or publication opportunities, and for some, making contact with others in the same field was important. All this was true for non-academics as well as for academics.

What these answers tell us essentially is that the Program continues to fulfil its objectives and, although small, fills a real need in the research community. It is hoped that in the future there will be room for expansion - perhaps more countries will become interested in contributing to the endowment fund, thus allowing for more Fellowships each year.

5. Facts and Figures

Following this section is a series of Tables giving information on language, regions of origin, choice of host country, and gender for both applicants and Fellows, and finally, the names of all those who have served on the Selection Panel as well as those of the Fellows themselves.

For further information about the Program you are invited to contact the Program office at the address below:

The McNamara Fellowships Program
Room M-4029
World Bank Headquarters
1818 H Street, NW
Washington, DC 20433
USA

Robert S. McNamara Fellowships Program

Table 1: Applications by Language Distribution

Cycle	Application Forms Distributed				Applications Received			
	English	French	Spanish	TOTAL	English	French	Spanish	TOTAL
1983	2191	625	197	3013	1226	205	58	1489
Percentage	(72.7)	(20.7)	(6.6)		(82.3)	(13.8)	(3.9)	
1984	1647	687	284	2618	513	202	84	799
Percentage	(63.0)	(26.2)	(10.8)		(64.2)	(25.3)	(10.5)	
1985	1873	472	265	2610	471	118	74	663
Percentage	(71.8)	(18.0)	(10.2)		(71.0)	(17.8)	(11.2)	
1986	2496	479	267	3242	453	128	90	671
Percentage	(77.0)	(14.8)	(8.2)		(67.5)	(19.1)	(13.4)	
1987	2677	688	794	4159	851	202	155	1208
Percentage	(64.4)	(16.5)	(19.1)		(70.4)	(16.8)	(12.8)	
1988	1411	387	401	2199	456	110	78	644
Percentage	(64.2)	(17.6)	(18.2)		(70.8)	(17.1)	(12.1)	
1989	684	215	287	1186	233	43	46	322
Percentage	(57.7)	(18.1)	(24.2)		(72.4)	(13.3)	(14.3)	
1990	835	291	308	1434	258	53	45	356
Percentage	(58.2)	(20.3)	(21.5)		(72.5)	(14.9)	(12.6)	
1991	677	156	139	972	288	70	24	382
Percentage	(69.7)	(16.0)	(14.3)		(75.4)	(18.3)	(6.3)	

* These figures are for application forms distributed to individuals who requested them and do not reflect the institutional mailing.

Table 2(a): Applications by Regional Distribution

REGION	1983	1984	1985	1986	1987	1988	1989	1990	1991
1. Africa	447	292	252	254	423	246	121	128	163
Percentage	(30.0)	(36.5)	(38.0)	(37.9)	(35.0)	(38.2)	(37.5)	(36.0)	(42.7)
2. Asia	546	204	214	189	370	192	81	120	119
Percentage	(36.7)	(25.5)	(32.3)	(28.2)	(30.7)	(29.8)	(25.2)	(33.7)	(31.1)
3. Europe, Middle East and North Africa	258	137	88	97	172	77	34	33	55
Percentage	(17.3)	(17.2)	(13.3)	(14.4)	(14.2)	(12.0)	(10.6)	(9.3)	(14.4)
4. Latin America and the Caribbean	97	122	87	97	188	102	57	51	35
Percentage	(6.5)	(15.3)	(13.1)	(14.4)	(15.6)	(15.8)	(17.7)	(14.3)	(9.2)
5. North America	135	41	22	32	55	27	29	24	10
Percentage	(9.1)	(5.1)	(3.3)	(4.8)	(4.5)	(4.2)	(9.0)	(6.7)	(2.6)
6. Non-Bank Member Countries	6	3	0	2	0	0	0	0	0
Percentage	(.4)	(.4)	-	(.3)	-	-	-	-	-
TOTAL	1489	799	663	671	1208	644	322	356	382

Table 2(b): Fellows by Regional Distribution

1. Africa	3	4	4	1	3	1	1	3	1
Percentage	(27.3)	(30.8)	(30.8)	(10.0)	(42.9)	(14.3)	(11.2)	(20.0)	(11.2)
2. Asia	2	6	4	5	1	2	2	6	4
Percentage	(18.2)	(46.1)	(30.8)	(50.0)	(14.3)	(28.5)	(22.2)	(40.0)	(44.3)
3. Europe, Middle East and North Africa	1	2	1	1	1	1	-	-	3
Percentage	(9.0)	(15.4)	(7.7)	(10.0)	(14.3)	(14.3)	-	-	(33.3)
4. Latin America and the Caribbean	3	1	1	2	2	2	2	1	1
Percentage	(27.3)	(7.7)	(7.7)	(20.0)	(28.5)	(28.5)	(22.2)	(6.7)	(11.2)
5. North America	2	-	3	1	-	1	4	5	-
Percentage	(18.2)	-	(23.0)	(10.0)	-	(14.3)	(44.4)	(33.3)	-
TOTAL	11	13	13	10	7	7	9	15	9

Table 3: Host Countries

Year	Region	No. of Fellows in Region	Countries
1983	Africa	1	Burundi
	Asia	5	Bangladesh, India, Philippines, Sri Lanka, Thailand
	EMENA	2	France, Tunisia
	LAC	3	Colombia, Dominica, Trinidad
1984	Africa	4	Cameroon, Kenya, Niger
	Asia	5	China, Malaysia, Thailand
	EMENA	1	France
	LAC	1	Colombia
	N. America	2	USA
1985	Africa	2	Ivory Coast, Mali
	Asia	1	Philippines
	EMENA	1	Kuwait
	LAC	3	Costa Rica, Honduras
	N. America	6	USA
1986	Asia	2	India, Japan, Thailand
	EMENA	4	Belgium, Morocco, Norway, UK
	LAC	2	Argentina, Mexico
	N. America	2	USA
1987	Africa	3	Burkina Faso, Cameroon
	EMENA	1	France
	LAC	2	Brazil
	N. America	3	USA
1988	Africa	1	Senegal
	EMENA	1	UK
	LAC	2	Brazil, Panama
	N. America	3	USA
1989	Africa	4	Ghana, Kenya, Somalia
	Asia	2	China, Malaysia, Philippines
	EMENA	1	UK
	N. America	2	USA
1990	Africa	3	Ivory Coast, Nigeria
	Asia	5	India, Indonesia, Thailand
	LAC	2	Costa Rica, Mexico
	N. America	5	Canada, USA
1991	Africa	2	Burkina Faso, Ivory Cost, Kenya
	Asia	4	Bangladesh, India, Philippines, Thailand
	EMENA	1	Tunisia
	N. America	2	USA

NOTE: The number of countries does not necessarily tally with the number of Fellows. Some Fellows conducted research in more than one country, and groups conducted research in the same country.

Table 4(a): Gender Distribution of Applicants

	Number			Percentage	
Year	Male	Female	TOTAL	Male	Female
1983	1258	231	1489	84.5	15.5
1984	682	117	799	85.4	14.6
1985	574	89	663	86.6	13.4
1986	579	92	671	86.3	13.7
1987	981	227	1208	81.2	18.8
1988	562	82	644	87.3	12.7
1989	277	45	322	86.1	13.9
1990	271	85	356	76.2	23.8
1991	312	70	382	81.7	18.3
TOTAL	5496	1038	6534	84.1	15.9

Table 4(b): Gender Distribution of Fellows

1983	10	1	11	90.9	9.1
1984	10	3	13	76.9	23.1
1985	9	4	13	69.2	30.8
1986	8	2	10	80.0	20.0
1987	6	1	7	85.8	14.2
1988	4	3	7	57.1	42.9
1989	6	3	9	66.6	33.4
1990	7	8	15	46.7	53.3
1991	6	3	9	66.6	33.4
TOTAL	73	29	102	71.6	28.4

Robert S. McNamara Fellowships Program

Selection Panel Members 1983-1991

1983 & 1984

Chairman:	Mr. Munir Benjenk (Turkey)	
Members:	Mr. Mourad Benachenhou (Algeria)	Exec. Dir.
	Mr. C. Fred Bergsten (USA)	
	Mr. Rodrigo Botero (Colombia)	
	Mr. Jacques de Groote (Belgium)	Exec. Dir.

1985

Chairman:	Mr. S. Shahid Husain (Pakistan)	
Members:	Mr. Abdlatif Al-Hamad (Kuwait)	
	Mr. Mourad Benachenhou	
	Mr. C. Fred Bergsten	
	Mr. Rodrigo Botero	
	Mr. Mario Draghi (Italy)	Exec. Dir.

1986, 1987 & 1988

Chairman:	Mr. S. Shahid Husain	
Members:	Mr. Abdlatif Al-Hamad	
	Mr. Roger Dornbusch (Germany)	
	Mr. Mario Draghi	
	Mr. Xu Niajiong (China)	Exec. Dir.
	Mr. H.M.A. Onitiri (Nigeria)	

1989 & 1990

Chairman:	Mr. W. David Hopper (Canada)	
Members:	Mr. Paul Arlman (Netherlands)	Exec. Dir.
	Mr. Bela Balassa (Hungary)	
	Ms. Mayra Buvinic (Chile)	
	Mr. J.S.A. Funna (Sierra Leone)	Exec. Dir.
	Prof. A.K.Sen (India)	

1991

Chairman:	Mr. Wilfried P. Thalwitz (Germany)	
Members:	Ms. Mayra Buvinic	
	Prof. Arnold C. Harberger (USA)	
	Mr. Jean-Pierre Landau (France)	Exec. Dir.
	Mr. J. Ayo Langley (The Gambia)	Exec. Dir.
	Prof. A.K. Sen	

Robert S. McNamara Fellowships Program Awards

Name of Fellow	Home Country	Project Location	Year
Individual Awards			
ABRAHA, Haile "Effects of pulverized phosphate rock on crops"	Ethiopia	Niger	1984
ACHARYA, Ballabh P. "Positive land management for increasing urban land supply in India and South Asia"	Nepal	India/ Thailand	1986
AHIADEKE, Clement "Effects of River Blindness and migration on rural agriculture"	Ghana	Burkina Faso	1987
AHMED, Abbas "Internationalization of labor markets"	Sudan	Kuwait	1985
AL-SAQQAF, Abdulaziz "The destiny of a historic city: The case of Sana'a"	Yemen Arab Republic	U.S.A.	1985
AMBALI, Jayaprakashan "Dynamics of innovation implementation: The case of quality control circles"	India	Thailand	1984
ANDERSON, Julie "Legislation, development and legislating development in Brazilian rural labor markets"	U.S.A.	Brazil	1988

Name of Fellow	Home Country	Project Location	Year
APPLETON, Simon "Gender differences in educational attainment in Kenya: Exam performance and access to State secondary schools"	United Kingdom	Kenya	1991
AULT, Steven "Medical ecology of Sri Lanka's dry zone agro-ecosystems"	U.S.A.	Sri Lanka	1983
BALOGUN, Adebisi M. "Recycling of animal by-products and fish-processing wastes into low-cost rations for fish"	Nigeria	U.S.A.	1990
BEHRENS, Alfredo "Fresh water for Panama: An environmentally sustainable strategy"	Brazil	Panama	1988
BELISLE, Françoise (Declined award) "Government policies and programs toward the urban informal sector in Colombia, Ecuador and Peru: A Comparative Assessment"	Canada	Colombia Ecuador Peru	1985
BELLOUARD-ELLIOTT, Alixe "Increased protein availability through integrated fisheries"	Mauritius	Kenya	1984

Name of Fellow	Home Country	Project Location	Year
BERG, James "Rapid detection of microbiological quality of potable & fish-farming water"	U.S.A.	Norway	1986
BHADRA, Dipasis "Migration, urban poverty and policy coordination in LDCs: A case study of the Dhaka Metropolitan District, Bangladesh"	India	Bangladesh	1991
BOONE, Catherine M. "Structural adjustment and local private business in the Côte d'Ivoire"	U.S.A.	Côte d'Ivoire	1990
BOURIGA, Mahmoud "Returning emigrants & socioeconomic impact on Algerian economy"	Tunisia	France	1984
BRAGDON, Susan "Long-term resource planning through environmental legislation"	U.S.A.	Kenya	1989
CURREY, Bruce "Food crisis management"	United Kingdom	India/ Bangladesh	1983
DEOLALIKAR, Anil B. "The life-cycle pattern of intra-household and labor market gender discrimination in Thailand and Indonesia"	India	Thailand/ Indonesia	1990

Name of Fellow	Home Country	Project Location	Year
DIONELA, Athena A. "The interaction between legal and institutional framework for development: Focus on the dynamics between federal and state structures for rural development, Himachal Pradesh, India"	Philippines	India	1991
DIOP, Abdoulaye "Youth in development"	Senegal	France	1983
DOSHI, Tilak "A case study of consumer associations in Western Malaysia"	Singapore	Malaysia	1984
DUAH, Daniel K.A. "The economic and environmental implications of the toxic/hazardous waste trade: A risk-cost-benefit assessment"	Ghana	Canada	1990
DUGGAN, William (Declined award) "Small-herd economics in Botswana"	U.S.A.	Botswana	1984
DUTT, Gautam "The future of cooking technologies: The case of Mexico"	India	Mexico	1986

Name of Fellow	Home Country	Project Location	Year
EL-FATTAL, Lamia "The impact of food legume technology on farm households with particular emphasis on women"	Syria	Tunisia	1991
ELISSA, Nohal "Résistance aux insecticides des anophèles des régions de Bobo Dioulasso et de Bouaké"	Egypt/ France	Burkina Faso/ Côte d'Ivoire	1991
GIOVANNINI, Alberto "Capital controls and liberalization: Costs and benefits"	Italy	U.S.A.	1986
GOETZ, Anne M.M. (Award cancelled) "Strategies for the schooling of girls: Drawing policy inferences from patterns of intra-familial allocation incentives in Bangladesh"	Canada	Bangladesh	1990
GROSH, Barbara "Contract farming in Africa"	U.S.A.	Kenya	1989
HERBST, Jeffrey "Management of exchange rate reform in Ghana"	U.S.A.	Ghana	1989
HONG, Pingfan "Economic and trade relationships between China and the rest of the World: The LINK Project"	China	U.S.A.	1985

Name of Fellow	Home Country	Project Location	Year
HUQ, Saleemul "Study of cyanide resistant respiration in tropical root crops"	Bangladesh	United Kingdom	1986
IGWE, Godwin "Instrumentation & maintenance of equipment in small- and medium-scale industries in Third World Countries"	Nigeria	U.S.A.	1988
ISLAM-FARIDI, Nurul "Molecular analysis of novel alien gene introgression in cultivated rice"	Bangladesh	Philippines	1991
JENA, K. Kumar "Transfer of specific chromosome of wild rice into cultivated rice"	India	Philippines	1983
JOHNSON, Simon (Declined Award) "The development of the private sector in Poland"	United Kingdom	Poland	1991
JUNES, Guillermo Espino "Design & development of intermediate technology in the metal-working industries"	Peru	Colombia	1984
KAMANGA-SOLLO, Ernest "Immunodiagnostic procedures for *Taeniasis-cysticercosis*"	Tanzania	U.S.A.	1984

Name of Fellow	Home Country	Project Location	Year
KRISHNA, Kala "The role of auction quotas with imperfect competition: Theory & methodology for empirical application"	India	U.S.A.	1988
LANGE, Carlos "New methods of locust control"	Argentina	U.S.A.	1985
LIU, Xin "Synthesis of modified taxols: New anti-tumor drugs"	China	U.S.A.	1986
MATTHEWS, Ronald "Developing technological capabilities in the Third World: Perspectives on Kenya"	United Kingdom	Kenya	1984
McCLINTOCK, John "Financial & economic implications of farm forestry in semi-arid Africa"	United Kingdom	Senegal	1988
MEAGHER, Kathleen M. "The effect of parallel trade and market liberalization on smallholder incomes in northern Nigeria"	Canada	Nigeria	1990
MEHTA, Aasha K. "Technology transfer and the regaining of lost markets"	India	U.S.A.	1989
MEZA ESTRADA, Miguel "A comparative study of education administration of Japan & the U.S. and its potential uses for Mexico"	Mexico	Japan/ U.S.A.	1986

Name of Fellow	Home Country	Project Location	Year
MOLINA, A. "Economic study on the epidemiology of air pollution"	Honduras	Mexico	1990
MONTENEGRO, Santiago "Impact of exchange rate devaluation on inflation, the balance of payments, and the public sector's budget deficit in a small open economy"	Colombia	United Kingdom	1988
MTAWALI, Katundu (Declined award) "The economic & commercial aspects of SADCC's food security program"	Malawi	Zimbabwe	1986
MUHTAR, Mansur (Declined Award) "Regulations, institutions and development : A two-country case study of fertilizer sector privatization"	Nigeria	Togo/ U.S.A.	1991
NAYLOR, Rosamond L. "Culture and agriculture: Employment practices affecting women in Indonesia's rice sector"	U.S.A.	Indonesia	1990
NGUIAGAIN, Titus "Public goods, migration and unemployment: The case of the Philippines"	Cameroon	Philippines	1985

Name of Fellow	Home Country	Project Location	Year
NITCHEMAN, Salifou "Insecticide sensitivity levels of infected and non-infected Tsetse flies"	Burkina Faso	France	1987
OKORODUDU-FUBARA, M. "Coursebook an environmental law: Materials and text"	Nigeria	U.S.A./ United Kingdom	1990
OMARA-OPYENE, A.L. (Award cancelled) "Development of immunodiagnostic procedures for East Coast Fever"	Uganda	U.S.A.	1989
PALANISAMI, Kuppannan "Performance evaluation & investment priorities in irrigation systems of North East Thailand"	India	Thailand	1983
PASCAL de PEREZ, Marina "Construction standards & urban equipment in earthquake risk areas: The case of Grand Mendoza and its applicability to Panama City"	Panama	Argentina	1986
POLSON, Rudolph A. (Declined award) "Technology adoption, gender roles and economic development in southwestern Nigeria"	Liberia	Nigeria	1991

Name of Fellow	Home Country	Project Location	Year
QUIROZ, Alfonso "Role of international and domestic credit in a small open economy"	Peru	U.S.A.	1989
RADULOVICH, Ricardo "AQUA: An integrated water model for tropical cropping: Applications to Costa Rica"	U.S.A.	Costa Rica	1985
RAMACHANDRAN, Raman "Prospects of plant odorants for insect control in soya bean"	India	U.S.A.	1990
RIVAS-PEREZ, Priscilla "Women's participation, economic crisis, and primary health care: Productive capacity of health providers and beneficiaries in Costa Rica"	U.S.A.	Costa Rica	1990
ROLDOS, Jorge "The terms of trade and real exchange rate"	Uruguay	U.S.A.	1989
SAKTHIVEL, N. "Biological control of bacterial blight in rice"	India	Philippines	1989
SAMATAR, Abdi I. "Indigenous merchants, economic crisis & future opportunities: The case of Somalia"	Djibouti	Somalia	1989

Name of Fellow	Home Country	Project Location	Year
SELLA, Gabriel E. "Impact of zinc on nutrition and diarrhea in young children"	Canada	Bangladesh	1983
SHAFEE, Meeransa "Development of aquaculture programs in Morocco"	India	Morocco	1986
SHRESTHA, Dinesh Lal "Alleviating poverty through improved rural small hydropower schemes in developing countries"	Nepal	Thailand	1991
SOME, Jean-Bosco "Motivation of African Entrepreneurs: The case of Cameroon"	Burkina Faso	Cameroon	1984
SPINELLI, Gustavo R. "Virus and filaria transmission by ceratopogonidae (diptera). A biosystematic study of the neotropical species of culicoides diabolicus group"	Argentina	U.S.A.	1991
SULTANA, Monawar "Empowerment and change: Women caterers in Bombay"	Bangladesh	India	1990
THIOYE, A. Bamba "Laterite as a building material in low-cost housing"	Senegal	Mali	1985

Name of Fellow	Home Country	Project Location	Year
TOMLINSON, Richard "Restructuring the apartheid city: Alleviating poverty in South Africa's townships"	S. Africa	U.S.A.	1991
TOMEKPE, Kodjo "Identification and characterization of bacterial functions involved in stem and root nodulation"	Togo	Belgium	1986
TOMU, Anota "The importance of *Bruchid* beetle damage in smallholder grain legume storage"	Zaire	Burundi	1983
TOURE, Mohamed L. "A study of village water supply for irrigation purposes"	Côte d'Ivoire	Tunisia	1983
UADIA, Patrick O. "Immunochemotherapy of malaria: More effective non-resistant treatment"	Nigeria	U.S.A.	1987
WANG, Yan "Life-cycle wage, age structure of the population and personal savings: A comparative study of the U.S., China and other LDCs"	China	U.S.A.	1988
WEBER, Karen "Study of the contributions to development through fish farming: A case study of the Cote d'Ivoire"	U.S.A.	Côte d'Ivoire	1985

Name of Fellow	Home Country	Project Location	Year
WIDNER, Jennifer A. "Rural responses to income instability: Agricultural systems market structure and social organization among farmers in Côte d'Ivoire"	U.S.A.	Côte d'Ivoire	1990
WILLIAMS, Allan "Methods of bridging agricultural information gaps"	Guyana	Trinidad/ Dominica	1983
WILLIAMS, Timothy O. (Declined Award) "Real exchange rate and the livestock subsector"	Nigeria	Ethiopia/ Botswana/ Kenya	1989
WONG, Lung-Fai "The new socialist agricultural ladder system in China"	Hong Kong	China	1984
WOO, Wing Thye "Real exchange rate management for industrialization"	U.S.A.	East & Southeast Asia	1989
YANG, Fu-qiang "Energy regional economics and the application of the Fuzzy Set Theory"	China	U.S.A.	1984
YOUNGER, Stephen D. (Declined award) "Growth rate effects of IMF-style stabilization programs: A case study of Ecuador"	U.S.A.	Ecuador	1987

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YOUSIF, Ali "Clay mineralogy of selected soils in the Sudan"	Sudan	U.S.A.	1985
ZOU, Gang "Modelling the enterprise behavior under the two-tier plan/market system in the People's Republic of China"	China	U.S.A.	1990
Group Awards			
BHATTACHARYA, Alok **BHATTACHARYA**, Sudha "Development of *E. Histolytica* DNA probes"	India India	U.S.A.	1985
CHAUDHURI, Pinky **TILL**, Naomi "Participation of women in cooperatives & productive groups in Honduras"	India U.S.A.	Honduras	1985
DEVARAJAN, Shantayanan **RODRIK**, Dani "Trade and tax reform in constrained economies"	Sri Lanka Turkey	Cameroon/ U.S.A./& Thailand	1987
KASHYAP, Arun **FOX**, Jefferson (Award cancelled) "Community forestry and common property regimes in Nepal"	India U.S.A.	Nepal	1987

Name of Fellow	Home Country	Project Location	Year
Group Awards (Continued)			
LANDIVAR, Jorge **GANGOTENA-GONZALEZ** **LANDIVAR**, Margarita "Capital mobilization by squatters to finance low-cost housing"	Ecuador Ecuador	Colombia	1983
ROJAS de ARIAS, Antonieta **SCHMEDA HIRSCHMAN**, G. "Natural products as alternatives in controlling Chagas"	Venezuela Paraguay	Brazil	1987
KOVOOR, Elizabeth **SREEBHASHYAM**, Malini "Income and investment patterns among working women in Malaysia"	India India	Malaysia	1984
THAPPA, Indra J. **GYAWALI**, Dipak "Resource management under conditions of environmental stress"	Nepal Nepal	India	1990