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CONTENTS

PRESENTATION

The decisions of one economic agent affect those of others. The behavior of one economy influences the performance of other countries. The economy globalizes and the economic problems that seemed to be particular for certain geographical or cultural environments, today look very similar in different contexts. In that sense, economic theory should be built based on those phenomena that are not particular cases but rather general regularities; in other words, models to explain economic behavior should be based on assumptions of rational behavior of economic agents maximizing their wellbeing in a stochastic and dynamic environment.

The search to construct models to interpret the reality of the Bolivian economy, and of the countries that form the Latin American world, has been the premise on which this Journal was born. We hope that the papers included in this issue will help towards the achievement of this important objective.

We are grateful to the investigators that sent us their papers, and to the referees that spent their time evaluating and contributing to improving the drafts. Like in the previous issue, we are indebted to Dr. Carlos Gerke, Rector of our University, and to all the authorities of the Universidad Católica Boliviana that supported this publication. Our special recognition goes to Mtro. Carlos Rosso, Director of the Department of Culture. Without his collaboration, this effort would not have culminated successfully. We express our gratefulness to the generous support of the Institut für Weltwirtschaft in Germany.

To our colleagues and friends that today begin to thumb through this Journal: bon appétit.

Alejandro F. Mercado
DIRECTOR IISEC - UCB

RESEARCH PAPERS

Political Institutions and Growth Collapses

Alejandro Gaviria, Ugo Panizza
*Jessica Seddon and Ernesto Stein**

Summary

This paper tests whether Rodrik's (1999) results that institutions for conflict management are associated with the ability to react to economic shocks are robust to different ways of defining the quality of such institutions. In this paper, we measure the quality of conflict management institutions with two different indices. The first is an index of political constraints on the ability of the executive to impose its will. These constraints limit the ability of the government to arbitrarily change the rules of the game and therefore may reduce redistributive struggles. The second index measures the degree of political particularism. We define political particularism as the policymakers' ability to further their career by catering to narrow interests rather than broader national platforms. The indices used in this paper solve the endogeneity and subjectivity biases that affect Rodrik's main measure of institutional quality. We find strong support for the idea that high levels of political constraints and intermediate levels of political particularism are associated with a quick recovery from economic shocks.

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1. Introduction

In a series of recent papers, Rodrik (1999, 2000a, 2000b) asks the question, "Why did so many countries that grew at a satisfactory rate during the 1960s and early 1970s experience collapses in their growth rates after the economic shocks of the mid 1970s?" In his papers, Rodrik argues that the ability to recover from external shocks depends on the level of latent social conflict and on the quality of a country's institutions for conflict management. According to Rodrik, countries that have low latent social conflict and good institutions for conflict management can implement policies that minimize the effects of the shock on the economy and quickly resume their growth process. The opposite is true in countries with high latent social conflict and poor institutions where, in the best case, necessary reforms will be delayed and, in the worst case, the shock will generate distributional conflicts that may lead to an economic collapse. Rodrik illustrates this point with the example of how South Korea, Brazil, and Turkey reacted to the oil shock of the mid 1970s. While Korea, thanks to its adjustment policies, was able to quickly resume growth, Brazil and Turkey experienced an economic collapse. Rodrik attributes these diverse experiences to the fact that Korea lacked latent social conflict and had better institutions for conflict management. The importance of these institutions extends to windfalls as well as shocks: the experience of, among others, Nigeria and Venezuela show that distributional conflicts that lead to bad policies can also arise from positive terms of trade shocks (Tornell and Lane, 1999).[1]

Rodrik tests his hypothesis by regressing changes in growth over a measure of terms of trade shock, a measure of latent social conflict, and an indicator of the quality of institutions for conflict management (he also uses a set of standard control variables). In this paper, we suggest that the indicators of institutional quality used by Rodrik suffer from two sources of bias and we suggest a set of alternative measures of institutional quality. Rodrik's main proxy for conflict management institutions is the International Country Risk Guide (ICRG) index of quality of government institutions.[2] There are two possible problems with the ICRG measure of institutional quality used by Rodrik. First, the ICRG index is partly based on the subjective perceptions of a country's level of

1 For a description of the ICRG indexes see Seldy (1999).

2 In particular, the political risk assessments are made on the basis of subjective analysis of the available information, the financial risk assessments on a mix of subjective analysis and objective data, and the economic risk solely on the basis of objective data.

institutional quality.[3] This subjective index may be influenced by a country's overall economic condition (the subjectivity bias). Also, since the ICRG index of institutional quality is not available for the 1970s, Rodrik uses the 1980-90 average. Even if the ICRG index were not affected by a subjectivity bias, we would expect some feedback from growth to institutional quality (the endogeneity bias).[4]

In contrast, the indices used in this paper are available for the 1970s and originate from an effort to provide more objective measurements of the political structure. In particular, we proxy for the quality of institutions for conflict management with two specific aspects of political institutions. The first one is the existence of political constraints on the ability of the executive to impose its will. These constraints, which can be thought of as "checks and balances," limit the ability of the government to arbitrarily change the rules of the game and therefore may reduce redistributive struggles. The second one is the extent to which the political system creates incentives for politicians to respond to particularistic interests, rather than broad-based interests. An excessive focus on particularistic interests may exacerbate the distributive struggle that may follow an adverse shock (or a large windfall, for that matter).

For the first institutional dimension, we rely on a modified version of an index of political constraints developed by Witold Henisz (2000). According to Rodrik, good conflict management institutions should allow for the representation of all groups in society, and consist of agreed-upon, openly and consistently applied rules for adjudicating distributional conflicts. This index fits quite well with the spirit of Rodrik's (1999) model. In his model, two groups have to divide a pie—which they previously shared in equal parts but that has suddenly shrunk because of a negative shock. If the groups cooperate, and reduce their demands proportionally to the size of the shock, social conflict will be avoided and both groups will be able to maintain their pre-shock shares. Distributive struggle can instead arise if the groups decide to fight in order to keep their pre-shock incomes. In this framework, weak institutions for conflict resolution may give the various social groups the hope that they will be likely to win in a distributive fight and, thus providing an incentive against cooperation. So, in Rodrik's model, good institutions for conflict management are those that yield an equilibrium in which the payoff of cooperation is higher than that of fighting. In other words, a well-defined set of rules and

3 La Porta *et al.* (1999) and Panizza (2001) find a strong correlation between per capita GDP and the ICRG index.

constraints and a wide range of interests represented in policymaking reduce the scope for distributive conflict because people realize they can "kick and scream and yell" but their share of the pie will not change. In this ideal world, fighting does not pay and all parties will moderate their demands to avoid the costs of a distributive struggle.

Graham et al. (1999) find that reforms that are implemented through formal institutions and accepted after negotiations with many groups by a majority of society are more likely to be successful. To the extent that high political constraints increase the participation process and make it difficult to arbitrarily change distributionally sensitive policies, the index should be a very appropriate proxy for Rodrik's idea of "institutions that adjudicate distributional contests within a framework of rules and accepted procedure—that is, without open conflict and hostilities" (Rodrik, 1999, p. 386). Political constraints, on the other hand, may lead to gridlock and inaction, thus preventing the adoption of necessary adjustment policies. This is an issue of credibility of policy changes versus flexibility and, as theorists say, it is essentially an empirical question. However, it should be pointed out that the fact that reforms are more difficult to implement is a consequence of having more representation.[4]

For the second institutional dimension, we use data on electoral rules to create an index of political particularism. Following theoretical work on the subject by Carey and Shugart (1995) and Shugart (2001), we define political particularism as the ability of policymakers to further their careers by catering to narrow interests rather than to broader national platforms. A high score of the index indicates that the system is "candidate-centered" with strong incentives for politicians to cater to narrow geographical interests.[5] A low score, however, is more ambiguous, as "party-centered" only indicates low particularism to the extent that parties themselves have broad national interests.

The relationship between particularism and the ability to recover from an economic shock is ambiguous. If we assume that the main distributional struggle following the shock

4 The index of political constraints can also be thought of as a measure of the number of interests that the executive has to take into account when making a decision and a high value of the index means that a wider variety of interests are formally represented.

5 Geographically defined particular interests are the most easily recognized, and, so far, the most commonly modeled in the literature. (Weingast et al., 1981; Bogo, 1999). The influence of sectorally defined particular interests, such as labor unions, is harder to identify without detailed knowledge of the country and its informal policymaking procedures.

will arise along a regional dimension, then we should find that a high value of our index leads to poor conflict management policies, and to slow recovery. The opposite should be true if the main conflict is between groups that are homogeneously represented across regions (say workers versus capitalists, or public sector employees). In the latter case, party-centered systems with narrow party interests could exacerbate the distributional conflict.

Furthermore, while particularistic systems may be affected by excessive "pork barrel" policies, these systems have a definite advantage in terms of representation and in terms of building incentives for legislators to gather information on the preferences of their constituencies. Particularistic systems can also generate mechanisms of yardstick competition among legislators and improve the efficiency of the political process.

Since the index of particularism increases when we move from party-centered to personalistic systems, we may expect that the most efficient systems are those where the index takes intermediate values. If in fact systems where politicians must balance the interests of voters and party leaders are the ones that allow better management of distributional conflict, we should find a non-linear relationship between our index of particularism and the reaction to economic shocks.

The paper is organized as follows. Section 2 describes the indices of political constraints and political particularism. Section 3 looks at the correlation between these indices and the ability to react to economic shocks. Section 4 discusses the use of composite conflict indicators. Section 5 concludes.

2. The Data

This section describes the indices of political constraints and political particularism and discusses the methodology used to compute them as well as the main ideas behind their construction.

2.1 The Index of Political Constraints

The index of political constraints, first developed by Henisz (2000), attempts to capture the ability of political institutions to prevent arbitrary changes of the status quo. The idea underlying the index is simple: the existence of multiple independent

branches with veto power over policy initiatives increases the predictability of policies by restricting the range of discretion of policymakers to change the status quo. If government branches can veto each other's initiatives, politicians will be forced to propose alternative policies that are palatable to each of the independent branches. In addition to the existence of independent branches with veto power, the distribution of political preferences matters in this context. Thus, if the preferences of the legislature were perfectly aligned with those of the executive, the existence of an independent legislature would not be restricting the discretion of the executive in any way. The larger the number of independent veto points, and the farther the preferences of these branches from those of the executive, the greater the constraints on the ability of the policymakers to modify regulatory policy, tax policy, and other relevant policies.

We use a simple spatial model in the spirit of Henisz to study how the degree of political constraints varies as the political preferences of the independent branches of government become more alike. We restrict the analysis to the case of two independent branches. The initial setup is simple. There are two distinct political actors — the executive and the legislature in this case — that have the ability to veto each other's initiatives. Both actors have well-defined preferences over policy outcomes, and both are trying to find a viable alternative to change the status quo.

If both actors have very different preferences over policy outcomes, the points of coincidence will be few, and the status quo will be likely to prevail as the default policy. By contrast, if the executive and the legislature have similar preferences, the points of coincidence will be many, and viable alternatives to the status quo will be found with high probability.

Thus, political constraints will increase as the preferences of the executive and the legislature become less aligned. Little can be said, however, about the exact nature of the relationship between political constraints and the preferences of political actors in the absence of extra assumptions. Here we follow Henisz (2000) and make some specific assumptions concerning the nature of the political interaction between the executive and the legislature.

In Henisz's model, the political space is the unit interval, and both the status quo (X0) and the preferences of the executive (Xe) and legislature (Xl) are independent

draws from a uniform distribution. Figure 1 shows two typical draws of the model. In Figure 1a, the preferences of both actors are to the left of the status quo. The bold line shows the set of policy outcomes preferred by the executive to status quo, the thin line shows the set of policy outcomes preferred by the legislature to status quo, and the dotted line shows those policies preferred by one actor but not by the other. In our terminology, the dotted line represents the range of political constraints, which in this case spans approximately one third of the policy space.

In Figure 1b, the preferences of the executive are to the left of the status quo and the preferences of the legislature to the right. As before, the bold and thin lines show the set of policy outcomes preferred by the executive and the legislature to the status quo. Here, however, there is no overlapping of bold and thin, and the range of political constraints spans the whole policy space.

Figure 1a: Political Constraints and Preferences

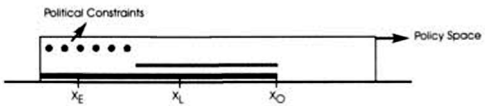
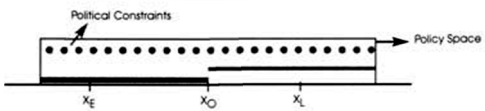


Figure 1b: Political Constraints and Preferences



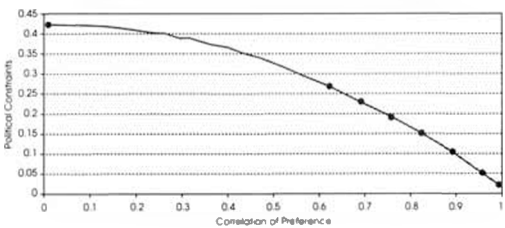
E= Executive, L= Legislative, O=Satus Quo

If we repeat the previous procedure for all possible triplets (X0, Xe and Xl), compute the range of political constraints for each triplet assuming no correlation among the preference of the executive and legislative, and average the corresponding values, we will obtain the average range of political constraints when the executive and the legislature have independent preferences. The range of political constraints spans in this case more than 40 percent of the policy space (there is no clear interpretation for

this number, it just comes out of all possible combinations of X0, Xe and Xl). We can do the same to compute the range of political constraints when there exists some degree of association between the preferences of the executive and the legislature. Figure 2 shows the relationship between political constraints and the correlation of preferences. Political constraints go down as the correlation goes up, the relationship is approximately quadratic, and the range of political constraints goes from zero to 0.42.

In this paper, we use information about the composition of the legislature to determine the degree of association between the preferences of the executive and the legislature. More precisely, we use the share of seats of the party of the president in congress to estimate the correlation of preferences between the executive and the legislative. The procedure entails three steps. First, we assume that if the party of the president controls over 2/3 of the legislature, the preferences of both branches will be completely aligned. Second, we assume that if the main opposition party controls over 2/3 of the legislature, the preferences of both branches will be independent. And third, we assume that, for the remaining points, the degree of association between the preferences of both branches of government depends on the fraction of seats controlled by the party of the president.[6]

Figure 2: Political Constraints and Preferences Align



After estimating the correlation of preferences of the executive and the legislature, we use the function depicted in Figure 2 to compute the index of political constraints. Although in theory the index can be easily generalized to include additional branches (e.g., the judiciary), in practice the implementation can be difficult because information

6 All the results reported here are robust to small variations in this procedure.

about the political composition of the judiciary is very difficult to come by For this reason, we restrict the analysis to two independent branches Table 1 presents regional averages of the index for both the 1970-75 and the 1980-89 periods

Table 1: The Index of Political Constraints

	1970 - 1975			1980 - 1989		
	Mean	St.Dev.	N	Mean	St.Dev.	N
Africa	0.26	1.04	43	0.40	1.22	46
Asia	1.15	2.50	33	1.09	2.43	34
LAC	1.89	2.67	22	2.75	2.45	23
OECD	5.83	3.24	21	5.81	2.54	21
Other Europe	0.50	1.59	10	0.47	1.04	11
All Countries	1.69	2.93	129	1.90	2.84	135

The original 0-1 index was re-scaled into a 0-10 range

2.2 The Index of Political Particularism

Our second institutional dimension is an index of political particularism originally conceptualized by Carey and Shugart (1995) and Shugart (2001) and operationalized by Seddon et al (2003) Carey and Shugart (1995) define particularism as the policymakers' ability to further their career by catering to narrow interests rather than broader national platforms

In creating the index, we are limited by data availability Although, we would like to follow Shugart (2001) to describe particularism due to extreme party-centeredness as well as particularism due to candidate-centeredness, our data does not allow us to differentiate between those party-centered systems where politicians must cater to a broad party platform from those where they have incentives to cater to a narrow party leadership clique, or camarilla.[7] For this reason, we base our index on Carey and Shugart (1995), where all party-centered systems are placed in the same category Even with this caveat our results agree with Shugart's (2001) finding that the middle range of the index is the most efficient for policymaking

7 The word "camarilla" was originally used to refer to the closed group of advisors that surrounded the Spanish kings

The index has three components (i) ballot, (ii) pool, and (iii) vote Each component is described in greater detail Seddon et al (2003)

Ballot describes the ease with which someone could get her name on the ballot in a position that makes winning a seat likely Closed-list systems where parties determine the candidates as well as their order in the ballot make this access difficult, and are therefore scored as 0 Systems where party nominations are required for a viable candidacy, but voters can determine the order of candidates on the party's list are scored as 1 Electoral systems where party nomination is not required for a successful campaign make access the easiest, and are scored as 2

Pool measures the extent to which a candidate can benefit from the votes of other candidates from her own party The assumption here is that candidates who do not expect to receive "spillover" votes from co-partisans will try harder to build personal reputations Proportional representation systems where votes are pooled across candidates are scored as a 0, systems where parties present multiple lists are scored as 1, and systems where votes accrue only to individual candidates are scored as 2

Vote measures whether voters cast votes primarily for candidates or parties Systems where voters can only choose among parties are scored as 0 Systems where voters can express preferences for multiple candidates either within party lists, across parties, or through a two-stage election (i e primaries or run-offs) are scored as 1 Finally, systems where voters cast only one vote, either for a candidate or a party faction, are scored as 2

We follow Shugart (1999) in averaging the scores of these three variables to create a summary index of particularism for each set of legislators who are elected via a certain electoral system [8] In unicameral systems this summary index corresponds to the whole legislature, in bicameral systems to each house, and in mixed systems to each subset of legislators Each house is given a weight of 0 5, regardless of the relative numbers of seats Within each house, each group of legislators chosen under similar rules is given a weight according to its proportion of total legislators in that house

8 An alternative would be to build an index using principal component analysis

We were able to build a panel of measure of particularism covering 144 countries for a period of up to twenty years. Table 2 presents regional averages for the 1978-1987 and 1978-1997 periods.

Table 2: The Index of Political Particularism

	1978 - 1987			1978 - 1997		
	Mean	St.Dev.	N	Mean	St.Dev.	N
Africa	4.34	2.44	35	4.10	2.54	44
Asia and Pacific	5.66	2.75	25	5.21	2.55	36
LAC	2.87	2.51	27	2.72	2.57	30
OECD	3.48	2.00	17	3.42	2.00	17
Other Europe	4.99	1.97	11	3.73	2.19	17
Whole Sample	4.22	2.68	115	3.97	2.57	144

The original 0-2 index was re-scaled into a 0-10 range

Carey and Shugart (1995) and Shugart (2001) also emphasize that district magnitude can play a role in exacerbating the particularistic incentives present in the system. Higher district magnitude increases the degree of competition for the favor of whichever constituency —narrow geographical groups or party leaders— controls access to the ballot.[9] Carey and Shugart (1995) point out that, if ballots are closed and list order fixed, party-centeredness should rise with district magnitude because in larger district magnitude there are more candidates on the list, and each becomes relatively less important in the voters' minds. If districts are small, voters may confuse "party" and""individual" and hence individual reputation matters more. If ballots are open, on the other hand, we expect the importance of personal reputation to rise with district magnitude. Ideally, we would like to include district magnitude in our index of political particularism, but because of the non-univocal relationship between district magnitude and particularism, we build the index using only the first three components and enter district magnitude in our regressions separately from the index of particularism (we also interact district magnitude with ballot).[10]

9 Cox (1990) argues that more competition in a system will produce more centripetal forces - that politicians will be less inclined to cater to the median voter and more inclined to carve out (particularistic) niches.

10 Milesi-Ferretti *et al.* (2002) use district magnitude and a measure similar to ballot to explain the size and composition of government spending in a panel of OECD countries.

3. Empirical Analysis

In this section, we test the impact of political constraints and political particularism on a country's ability to recover from economic shocks. Following Rodrik (1999), we use the change in per capita GDP growth between the 1960-1975 and 1975-1989 periods as our dependent variable. This period is chosen because, during the shock ridden 1970s, many countries (in particular in Latin America and Africa) experienced large terms of trade shocks and collapses in their growth rates. At the same times, other countries (East Asia) which experienced similar (or worse) terms of trade shocks were able to sustain high rates of growth. The core idea in Rodrik's paper is that structural breaks in growth are due to the interaction among three factors: (i) external shocks; (ii) latent social conflict; and (iii) poor institutions for conflict management.

With the exception of the institutions for conflict management, our empirical analysis uses exactly the same variables used by Rodrik (1999): three regional dummies (Latin America, East Asia, and Africa), growth in the 1960-1975 period (to capture convergence effects, GR60-75), log of per capita GDP in 1975 (to control for a country's level of development, GDP75), a measure of external shock (computed as openness times the standard deviation of the first log-difference of the terms of trade, SHOCK), and ethno-linguistic fractionalization (as a measure of latent social conflict, ELF).[11]

Unlike the ICRG index, the index of political constraints is available starting from the 1960s. We can then solve the endogeneity bias by computing an average of political constraints for the early 1970s and use this average as a predictor for the change in growth. Furthermore, since political constraints depend mostly on political institutions and outcomes, its subjectivity bias is not as strong as that of the ICRG index. To evaluate the role of the endogeneity bias, we regress changes in growth on both average political constraints in the 1970-1975 period and political constraints in the 1980-1989 period. The 1970-1975 period precedes the economic shock that caused the collapse in growth and hence it is the one that should be used to address the endogeneity bias. 1980-1989 is instead the period for which the ICRG data used by Rodrik are available.

11 Rodrik also uses, as an alternative to ethno-linguistic fractionalization, income inequality. We prefer ethno-linguistic fractionalization because it is available for a larger set of countries and it is not affected by endogeneity problems.

The results of the regressions are reported in Table 3. To make sure that our results do not depend on a particular sample we report, next to the regressions for our index or political constraints, a regression for the same sample using the ICRG index. The third column of Table 3 provides a check on our analysis by simply reproducing, for our sample of 87 countries, Rodrik's finding that ICRG is strongly associated with changes in growth.[12]

We also find that higher political constraints are in all cases positively associated with changes in growth and that the correlation between the index and changes in growth is stronger when the index is computed for the 1970-1975 period. This suggests that Rodrik's results regarding the effect of mechanisms for conflict resolution on changes in growth survive when we resolve the endogeneity problem by ensuring that the measures of institutional quality are from the same time period as the break in growth. However, we find a significant difference in the magnitude of the effect. While a one-standard deviation change in the ICRG index is associated with a change in growth of 1.5 percentage points, the corresponding change in growth associated to a one-standard deviation change in political constraints is just above one half of a percentage point.

As some of the variables are highly persistent (for instance ELF) and the index of political constraints is not lagged with respect to growth in the 1960-75 period, we also experiment with a specification that is similar to an ordinary growth regression (this is done by subtracting GR60-75 from both the left and right hand side of the equation). The last column of Table 3 shows that the results are almost unchanged. The only difference being that in this last specification, ethnic linguistic fractionalization is only marginally significant (the p-value on a two tailed test is 0.15). However, the magnitude of its coefficient is unchanged.[13]

12 Our results are very close (both qualitatively and quantitatively) to the results of table 4, column 5 in Rodrik's paper.

13 We would like to thank an anonymous referee for suggesting this specification.

Table 3: Changes in Growth and Political Constraints

Dependent variable: per capita growth 1975-1989 minus per capita growth 1960-1975

	Political Constraints		ICRG	Growth
	1970-1975	1980-1989	1980-1989	Regression
LAC	-2.16 ***	-2.34 ***	-1.39 **	-1.45**
	(0.49)	(0.48)	(0.53)	(0.64)
E-ASIA	3.56 ***	3.64 ***	2.77 ***	1.84 ***
	(0.54)	(0.56)	(0.44)	(0.65)
AFRICA	-1.84 ***	-1.86 **	-2.42 ***	-1.20
	(0.66)	(0.69)	(0.56)	(0.84)
GR60-75	-87.64 ***	-95.02 ***	-93.24 ***	-2.06 ***
	(9.67)	(9.68)	(7.45)	(0.35)
GDP75	-0.77***	-0.62 **	-1.69 ***	-0.08
	(0.26)	(0.24)	(0.35)	(0.06)
SHOCK	-0.05	-0.05	-0.02	0.43 ***
	(0.04)	(0.04)	(0.03)	(0.10)
POLITICAL	0.19 **	0.15 **		
CONSTRAINTS	(0.07)	(0.07)		
ICRG			0.74 ***	
			(0.17)	
ELF	-1.41 *	-1.49 **	-1.03 *	-1.41
	(0.73)	(0.75)	(0.61)	(0.99)
CONSTANT	8.06 ***	7.19***	10.83 ***	15.18***
	(1.81)	(1.67)	(0.71)	(2.75)
R2	0.71	0.70	0.76	0.44
N	87	87	87	87

White's standard errors in parenthesis

* statistically significant at 10% ** statistically significant at 5% *** statistically significant at 1%

Next, we study the relationship between changes in growth and political particularism. As before, we use the same set of explanatory variables used by Rodrik and substitute the ICRG index with our index of political particularism. The results are reported in Table 4. The first column of the table shows that there is a positive but not statistically significant relationship between particularism and changes in growth. The second column supports Shugart's (2001) idea "that too much of anything is bad" and suggests the presence of a quadratic relationship between particularism and changes in growth. In particular, we find that the value of particularism that maximizes the dependent variable is 4.39, just above the mean value of 4.22 (the mean value for the

70 countries included in the regression is 3.68). Column 3 shows that district magnitude has not had an effect on change in growth, but its inclusion in the regression increases both the coefficients and the t statistics attached to particularism. To test Carey and Shugart's (1995) idea that district magnitude can have different effects if ballots are closed, we interacted district magnitude with ballot (results not reported here) but we do not find any significant results and we still find a significant quadratic relationship between particularism and changes in growth. Columns 4 to 7 show that the non-linear relationship between particularism and change in growth is robust to the inclusion of other political variables. In particular, we augment the regressions with dummies differentiating proportional from majoritarian electoral systems and parliamentary from presidential electoral systems. The inclusion of these dummies does not alter the relationship between particularism and growth.

Table 4: Changes in Growth and Political Particularism

Dependent variable: per capita growth 1975-1989 minus per capita growth 1960-1975

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LAC	-2.853***	-2.659***	-2.667***	-2.524***	-2.748***	-2.866***	-2.786***
	(0.582)	(0.539)	(0.518)	(0.554)	(0.546)	(0.613)	(0.652)
E-ASIA	3.167***	3.267***	3.407***	3.223***	3.281***	3.195***	2.914***
	(0.634)	(0.676)	(0.637)	(0.612)	(0.673)	(0.685)	(0.689)
AFRICA	-1.929**	-1.806**	-1.811**	-2.026**	-1.825**	-1.956**	-2.628***
	(0.798)	(0.788)	(0.780)	(0.775)	(0.804)	(0.847)	(0.767)
GR60-75	-100.214***	-96.286***	-99.233***	-92.552***	-95.218***	-96.585***	-93.265***
	(11.734)	(9.648)	(9.732)	(10.649)	(9.504)	(10.160)	(11.560)
GDP75	-0.305	-0.387*	-0.447*	-0.369	-0.449*	-0.341	-0.257
	(0.219)	(0.215)	(0.227)	(0.222)	(0.242)	(0.242)	(0.232)
SHOCK	-0.038	-0.043	-0.042	-0.046	-0.038	-0.042	-0.036
	(0.037)	(0.036)	(0.036)	(0.039)	(0.037)	(0.037)	(0.035)
PART	0.064	0.413**	0.625***		0.491**	0.518**	
	(0.090)	(0.200)	(0.192)		(0.242)	(0.231)	
PART2		-0.047*	-0.072***		-0.052*	-0.060*	
		(0.026)	(0.024)		(0.028)	(0.030)	
DIS. MAG.			0.247				
			(0.179)				
PROPORT				0.048	0.451		
				(0.382)	(0.503)		
PRESID						0.548	0.300
						(0.551)	(0.504)
ELF	-1.703**	-1.719**	-1.660*	-1.858**	-1.671*	-1.693*	-1.012
	(0.875)	(0.912)	(0.944)	(0.821)	(0.917)	(0.967)	(0.808)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CONST	5.330***	5.505***	5.370***	5.800***	5.528***	4.848**	4.675**
	(1.810)	(1.825)	(1.848)	(1.744)	(1.803)	(2.092)	(1.928)
R^2	0.647	0.664	0.678	0.607	0.669	0.675	0.605
N	70	70	70	87	70	69	82

White's standard errors in parenthesis.

* statistically significant at 10%, ** statistically significant at 5%, *** statistically significant at 1%.

While the index of particularism is built using information on a country's political constitution and electoral laws and, therefore, we are confident in the fact that the index does not suffer from any subjectivity bias, we cannot claim that the index is completely exogenous. As we do not have observations for periods before 1978 (and until 1980 the index covers less than 80 countries), we use an average of the index for the 1978-1987 period.[14] Since economic crises are often the spring for constitutional reforms our index could be endogenous. We do not think that this is a serious problem because, while it is clear that a crisis will negatively affect the ICRG index and hence cause an overestimation of its effect on growth, it is not so clear that economic crises will cause movements of the index of political particularism toward any well specified direction. There are also other factors that suggest that the problem may not be too serious. First, changes in electoral rules are fairly rare. In the 20 years covered by our panel, only 33 (out of 144) countries had significant changes in the aspects of the electoral law that we consider. Second, changes in electoral laws tend to be incremental in nature. We rarely observe one country that jumps from one extreme of the index to the other. Third, to some extent electoral laws are subject to fads and fashions. If movements in the electoral laws tend to be of similar nature across countries of the same region, controlling for regional dummies could capture part of these movements in the index of particularism.

Even though electoral law may not change much over time, their relevance depends on the level of democracy. During periods of dictatorship or military rule, the electoral rules set forth in the constitution and the law are seldom respected. Hence, we expect electoral rules to have an effect on economic outcomes only in democratic regimes. To test this hypothesis we take into account the level of democracy in the early 1970s and interact this variable with our index of particularism. We do this in two different ways.

14. We obtain similar results, but with smaller samples, by considering any shorter period including at least 1981. All the results of tables 3 and 4 are also robust to including other standard controls like the average level of education.

First, we augment our basic regression with the 1970-1975 average of the Polity III index of democracy and interact it with particularism (column 3 of Table 5).[15] Second, we generate a democracy dummy taking a value of 1 for countries that in the 1970-1975 period averaged 4 or more in the democracy index. We then enter this dummy and its interaction with particularism in the regression (column 6 of Table 5).

Rodrik (2000a, 2000b, 2000c) claims that democracy is the best way to solve conflict. Like Rodrik, we find that democracy is positively associated with changes in growth (columns 1 and 4) but the effect of democracy disappears when we control for particularism. Even more interestingly, we find that, after controlling for democracy, particularism alone loses its explanatory power, but it becomes highly significant when interacted with democracy. The two regressions of Column 3 and 6 give then the same answer: political particularism does not matter in dictatorships, but it is very important in democracies.[16]

Table 5: Changes in Growth, Political Particularism, and Democracy

Dependent variable: per capita growth 1975-1989 minus per capita growth 1960-1975

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LAC	-2.387***	-2.741**	-2.652***	-2.318***	-2.779***	-2.759***	-1.514***
	(0.525)	(0.534)*	(0.505)	(0.507)	(0.540)	(0.508)	(0.576)
E-ASIA	3.004***	3.077***	3.392***	3.237***	3.161***	3.073***	2.514***
	(0.652)	(0.692)	(0.785)	(0.696)	(0.675)	(0.681)	(0.560)
AFRICA	-2.147***	-2.376***	-2.302***	-2.156***	-2.441***	-2.536***	-2.560***
	(0.687)	(0.666)	(0.645)	(0.698)	(0.668)	(0.642)	(0.749)
GR60-75	-87.710***	-99.288***	-96.240***	-88.977***	-102.573***	-100.250***	-87.737***
	(9.533)	(8.302)	(8.646)	(9.806)	(8.869)	(8.976)	(8.889)
GDP75	-0.879***	-0.558**	-0.604**	-0.775***	-0.403	-0.603**	-1.732***
	(0.283)	(0.252)	(0.247)	(0.269)	(0.272)	(0.266)	(0.480)

15 The Polity III index is from Jaggers and Gurr (1996).

16 The null hypothesis that PART+D1*PART>0 is not rejected with a p value of 0.011 and the null that PART2+D1*PART2<0 is not rejected with a p value of 0.015. We find that the variability of political constraints is lower in democracy than in dictatorships, but the difference between the two groups is not as dramatic as in the case of the index of political constraints. The coefficient of variation of the index of political particularism is 0.7 for the whole sample, 0.9 for dictatorships, and 0.5 for democracies. In the case of political particularism, the ratio between the coefficient of variation of dictatorships and coefficient of variation of democracies ratio is 1.28. For the index of political constraints, this ratio is 4.8.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SHOCK	-0.041	-0.033	-0.038	-0.043	-0.033	-0.034	-0.020
	(0.035)	(0.034)	(0.033)	(0.034)	(0.033)	(0.030)	(0.034)
PART		0.282	-0.074		0.352	0.122	
		(0.219)	(0.307)		(0.220)	(0.274)	
PART2		-0.029	0.031		-0.037	-0.011	
		(0.029)	(0.040)		(0.029)	(0.035)	
DEMO	0.148**	0.058	-0.004				
	(0.062)	(0.052)	(0.086)				
D*PART			0.158**				
			(0.071)				
D*PART2			-0.029**				
			(0.013)				
DEMO1				1.070**	0.352	-0.849	
				(0.494)	(0.531)	(1.019)	
D1*PART						1.425**	
						(0.670)	
D1*PART2						-0.232**	
						(0.104)	
ICRG							0.719***
							(0.213)
ELF	-1.649**	-1.183*	-1.385*	-1.591**	-1.156	-1.313*	-1.272*
	(0.704)	(0.688)	(0.714)	(0.725)	(0.708)	(0.722)	(0.703)
CONST	8.890***	6.675***	7.133**	8.334***	5.731***	7.480***	11.365***
	(1.945)	(1.963)	(1.957)*	(1.929)	(2.060)	(2.101)	(2.562)
R2	0.687	0.724	0.744	0.684	0.721	0.746	0.673
N	90	72	72	90	72	72	70

White's standard errors in parenthesis * statistically significant at 10% ** statistically significant at 5% *** statistically significant at 1%

4. Conflict Variables

The key idea in Rodrik's paper is that the social conflict that determined the collapse in growth of the mid 1970s originated by a combination of the severity of the external shock, the presence of latent social conflict, and the quality of conflict management institutions. To test this idea, Rodrik builds four composite indicators of social conflict and finds that they have a strong negative correlation with economic performance. We follow Rodrik and use our indices of political constraints and political particularism to build indicators of the type

$$CONFPCON = Shock*ELF*(10-PCONST)$$

$$CONFPART = Shock*ELF*(|PART-10|)$$

Like Rodrik, we find a strong negative correlation between the indicators of social conflict and changes in growth [17] However, the results of a Monte Carlo simulation made us doubt the validity of this experiment In particular, we build a series of conflict indicators using the following formula

$$CONFRAND = X1*X2*RAND$$

where X1 and X2 are any two of the following (i) Shock, (ii) ELF, and (iii) P-CONST or PART RANDOM is instead a uniformly distributed random variable that ranges from 0 to 10 Then we use CONFRAND to run 10,000 replications of a regression similar to the ones reported in Table 5 of Rodrik (1999) and find that the coefficient attached to CONFRAND is highly significant in six out of seven simulations [18] This suggests that in most cases (always when one of the elements is ethnic fractionalization) two of the three elements are sufficient to get a significant impact of the conflict variable The simulation also indicates that, as we already found in Tables 3, 4, and 5, terms of trade shocks are weakly associated with change in growth

It should be pointed out that this experiment does not affect the validity of our (and Rodrik's) previous results By separately entering the three variables in the regression, we do find that they each have a strong impact on the dependent variable However, we believe that the regressions of Tables 3, 4, and 5 provide stronger support for Rodrik's model than the regression with the composite conflict variables because, once ethnolinguistic fractionalization is included in the index, we find that the conflict indicator is always significant, even when the institutional variable is substituted by a random number

17 Results available upon request

18 The coefficient is not significant when the two non-random variables are terms of trade shocks and the index of political particularism

5. Conclusions

In this paper we test whether Rodrik's (1999) results that a country's ability to recover from economic shocks depends on the quality of institutions for conflict are robust to indices that correct for subjectivity and endogeneity biases in the measurement of the institutional quality. In order to do so, we use a modified version of the index of political constraints developed by Henisz (2000) and an index of political particularism originally conceptualized by Carey and Shugart (1995) and Shugart (2001) and coded by Seddon et al. (2003). We claim that these indices are appropriate measures of institutions for conflict management as described by Rodrik (1999). With respect to the ICRG and democracy indices used by Rodrik (1999), our two indices have the advantage of being built on objective criteria and, for the index of political constraints, being available for the early 1970s. These two factors allow us to solve the endogeneity and subjectivity biases that affect the ICRG index used by Rodrik. We find that Rodrik's results are robust to the use of these new indices. In particular, we find that countries with higher levels of political constraints and intermediate levels of particularism were the most successful in reacting to the external shocks of the mid 1970s.

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An Empirical Investigation of the Internet and International Trade: The Case of Bolivia*

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Summary

This paper builds on Freund and Weinhold (2000) to show that the results of that paper can be applied to the case of Bolivia. We review the implications of the Freund and Weinhold model, emphasizing the effects of the Internet on increasing trade and lessening the effects of historical trading patterns in determining trade flows. Specifically, using a gravity model of trade for 56 countries including Bolivia, we show that the Internet stimulates trade and that Bolivia stands to gain an economically significant benefit from increased Web connectivity. Our results imply that a 10 percent increase in the relative number of web hosts in Bolivia would have led to about 1 percent greater trade in 1998 and 1999. The evidence is consistent with a model in which the Internet creates a global exchange for goods, thereby reducing market-specific sunk costs of exporting.

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1. Introduction

The internet is everywhere Web statistics of staggering proportions and every variety constantly make their way into news reports and political speeches, and the phenomenon is not limited to the industrialized world Anecdotal accounts of South American village women selling baskets to Swiss bankers, virtual medical advice being offered in Sub-Saharan Africa and other internet success stories have caught the imagination of more than one development agency Both the UN and the IADB have special sections devoted to internet-related development initiatives, and at the Japanese meetings of the G-8 in 2000, the development agenda was dominated by talk not only of debt relief, but also of increased "wiring" up of the developing world

The general excitement is shared by a number of academic economists as well Danny Quah, Alan Blinder, Graciela Chinchilinsky and many others have written about the potential gains, and possible problems, that the new knowledge-based internet economy (the "weightless economy" in Professor Quah's parlance) may bring for developing countries At the heart of the matter is increased technological transfer and lower transactions costs - the "death of distance" in the words of many a commentator

There can be no doubt that very fundamental innovations are underway and that the internet is at the heart of matter Nevertheless, so far most of the international evidence of systematic change has been primarily anecdotal in nature, and much of the statistical data available on the use of the web seems strangely disembodied There are numerous "snapshot" figures of web use, growth of web use, and bandwidth usage etc Academic studies of particular industries in certain countries carefully delineate the advantages and problems that firms have had to face in developing e-commerce opportunities Innumerable policy documents talk about and emphasize the huge potential benefits of e-commerce for developing countries in international trade However the authors of this paper have not been able to find any systematic, international statistical evidence of the effects of internet usage on trade patterns

In recent papers, Freund and Weinhold (2000) and Freund and Weinhold (2003) (henceforth to be referred to as FW), we have attempted to fill a small part of this gap

by asking whether the internet, anecdotes notwithstanding, has actually had a measurable, systematic impact on the observed patterns of international trade? If so, is it mostly a phenomenon of rich countries or has there also been some effect on the trading patterns of developing nations? FW (2000) and (2003) motives the empirical investigation with a trade model with imperfect competition and sunk costs and show that the internet has the potential to reduce market-specific sunk costs that have historically been very important for a large share of trade in goods.[1] Thus, the model implies that access to the Web has the potential to have the greatest impact on exports of countries that have not historically had strong trade ties. FW (2000) then uses a gravity model of international trade among 56 countries over the years 1995 to 1999 and find strong support for the predictions of the model. FW (2003) revises the theoretical analysis to focus on dynamic effects and extends the empirical testing to include a fixed effects panel data estimation. FW (2003) shows that the general implications of the results from FW (2000) are robust to this alternative form of estimation.

The predictions of the theoretical model in FW (2000) and (2003) have important implications for a country like Bolivia. In particular, it implies that access to the Internet could play a significant role in increasing trade ties by compensating for a lack of strong historical trade linkages. In this paper we examine the case of Bolivia in greater detail and consider the implications of Internet connectivity for the future evolution of Bolivia's international trade and competitiveness.

The paper proceeds as follows. Section 2 briefly reviews the main theoretical and empirical results from FW (2000). Section 3 examines the Bolivian case in more detail and section 4 concludes with a discussion of policy implications.

1 A large body of empirical work has shown that past linkages and business networks are significant determinants of current trade flows. After controlling for the standard determinants of trade, Eichengreen and Irwin (1998) show that past trade has significant explanatory power in explaining current trade patterns using aggregate trade data. Roberts and Tybout (1997) show a similar effect of history using firm level data. Rauch (1999) finds that colonial linkages and language help explain trade flows.

2. Testing for a Systematic Effect of the Internet on International Trade: A Review of the Main Results from Freund and Weinhold (2000)

2.1 Theoretical motivation

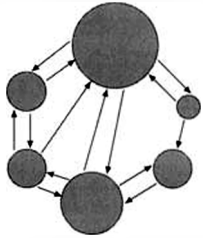
A number of recent papers have emphasized the importance of sunk costs in explaining trade flows (see, for example, Baldwin (1989), Eichengreen and Irwin (1998), Tybout and Roberts (1997), and Freund (2000)). Other models have emphasized the importance of local networks to overcome costs associated with imperfect information (see, for example, Rauch (1996, 1999, and 2000)). In the former models with sunk costs, trade is distorted because some exporters do not enter a market (while others do not exit) as relative prices adjust. In the latter type of model with imperfect information, trade is distorted because search is costly. In this case the best matches are unlikely to be identified, and once matches are found they will not change because it is costly to find a new partner. Both types of models imply that trade patterns will be persistent, and indeed empirical work has shown that past trade flows have large and statistically significant explanatory power in predicting current patterns of trade, even after controlling for all the standard variables.

In the spirit of this literature FW (2000) present a simple theoretical model of trade (following Brander and Krugman [1983]) with imperfect competition, segmented markets and sunk costs in order to demonstrate the effects of the introduction of the Internet, and thus the creation of a global exchange, on trade. The model yields three hypotheses about trade in a good produced in imperfectly competitive markets with fixed costs:

(i) A firm in a neighboring country is more likely to export and will export more than other firms because the fixed cost and the transport cost are both lower. A lower fixed cost directly increases the likelihood of exporting and a lower transport cost increases profits which also makes exporting more likely.
(ii) A firm is more likely to export to a large market.
(iii) History is important, the same exporters will always export in both periods in the two-period model.

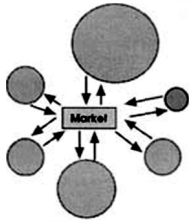
Figure 1 shows an example of what a market of this type may look like. Producers sell directly to foreign markets, and some producers do not sell to some markets. Producers are more likely to sell to neighboring markets and to large markets. In addition, because of the fixed cost of entry, firms in a market have significant market power and prices vary across countries.

Figure 1: Trade with Sunk Costs (Source: Freund and Weinhold 2000)



Next, they consider how trade is different with the internet. FW makes the point that the internet effectively aggregates world demand and world supply—markets are no longer segmented. The market now appears as in Figure 2. Countries buy and sell on the international market. All importing countries gain because the price is lower. Exporting countries gain from access to new markets and reduction or removal of the fixed cost. Welfare is enhanced because information asymmetries are reduced, as all members of any given exchange share the same information.

Figure 2: Trade with the Internet



The model yields four predictions about how the internet will affect trade flows

(i) Overall, trade will expand as the number of firms with access to the internet increases
(ii) Access to the internet reduces hysteresis While trade in the first period and in the second period might be the same with the internet, this would only be true if relative income and production remain unchanged
(iii) Countries that exported to a small number of countries before the internet will have the greatest increase in trade
(iv) The effect of distance on trade flows will be reduced if distance mainly influences trade because of information and hence sunk costs If distance affects trade because of transport costs then the effect of the internet on this relationship is ambiguous

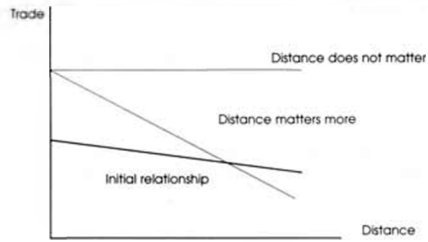
The theoretical model also implies that the internet is also likely to increase world welfare Increased competition implies that world prices should fall and converge Since all countries buy from the world market, prices must be identical, in addition, without the market-specific sunk cost, competition is more intense so prices must be lower Firms with established trade links may lose because they no longer have monopoly power That is, firms that exported to a lot of countries in the past might lose because they are now forced to sell at a lower price Similarly, countries that previously imported from only a few countries have a lot to gain in consumer surplus because the new price will be relatively lower

In sum, the relevant innovation of the internet is that it has the potential to create large global markets for specific traded goods, both directly via organized exchanges with numerous buyers and sellers and indirectly through powerful search engines which enable sellers to notify buyers of prices instantaneously This is very different from other recent innovations, such as the telephone or the fax, which only assist bilateral transactions The advantage of such a global marketplace is that sunk costs associated with establishing trade ties can be drastically reduced, and information about new buyers or sellers can be made widely available This has important implications for the size and pattern of trade flows among countries Indeed, a recent survey of 50 global eMarketplaces found that these companies' values comes from aggregating buyers and sellers across regions One executive from a Chemicals site noted that""If a French

chemicals company wanted to sell in China, it would spend a lot of money to expand into Asia. Now the firm can post on our site. The Chinese buyer looking for PVC is one click away from the French seller" (Sanders 2000b)

Finally, the possible effect of the internet on distance and trade is illustrated in Figure 3. The solid line shows the initial relationship between distance and trade. As distance between two countries increases, trade tends to fall, all else equal. The removal of information costs about distant markets shifts out the distance-trade locus, suggesting that the internet should reduce the effect of distance on trade. However, because transport costs can become more important, the slope of the line could increase, making the impact of distance on bilateral trade relatively higher.

Figure 3: The Internet, Trade, and Distance (Source: Freund and Weinhold (2000))



2.2 Empirical Investigation of the Effect of the Internet on Patterns of International Trade

FW (2000) presents a series of regression analyses designed to investigate the possible impact of increased web usage on patterns of international trade. In particular, they use a gravity model of trade among 56 countries for the years 1995 to 1999 to test some of the positive predictions of the model. Data on bilateral merchandise trade flows, GDP, and population are from the IMF. Data on geographic distances between countries is from Direct-Line Distances (1986). Data on common linguistic heritage and colonial links was compiled from Rand McNally and Co. Historical Atlas of the World (1994). Table 10 lists all of the countries included in the study.

The gravity equation is fundamentally based on the underlying "gravitational" relationship

(9) $TOT_{ij} = \omega (GPD_i GDP_j / DIST_{ij})$

where *TOT* is the total bilateral trading volume between countries i and j. Taking logs on both sides produces the specification

(10) $tot_{ij} = \beta_0 + \beta_1 (gdp_i gdp_j) = \beta_2 dist_{ij} = \varphi i_{ij}$

where $gdp_i gdp_j$ is the log of the product of the GNP's of country i and j.

Slightly embellishing the basic specification as is common in the literature, FW start by considering the following

(11) $tot_{ij} = \beta_0 + \beta_1 (gdp_i gdp_j) + \beta_2 (pop_i pop_j) + \beta_3 dist_{ij} + \beta_4 ADJ_{ij} + \beta_5 LANG + \beta_6 LINK + \beta_7 FTA + \varepsilon_{ij}$

where $pop_i pop_j$ is the log of the product of the populations of country i and j. and ADJ, LANG, LINK, and FTA are dummy variables which take the value 1 for adjacent countries, country pairs which share a common language, countries which share some colonial linkages, and country pairs which are both members of a free trade area, respectively

In order to attempt to measure how "wired" a country is - in effect attempting to capture the "cybermass" of internet usage - FW use data from the Internet Software Consortium (ISC) to count how many web hosts are attributed to each country by counting top-level host domain names. A top-level domain name is either an ISO country code or one of the generic domains (com/org/net/etc)

However, as FW concedes, this is certainly not an ideal measure. ISC notes that, "There is not necessarily any correlation between a host's domain name and where it is actually located. A host with a .NL domain name could easily be located in the U.S. or any other country. In addition, hosts under domains EDU/ORG/NET/COM/INT could be located anywhere. There is no way to determine where a host is without asking its

administrator ... In summary, it is not possible to determine the exact size of the internet, where hosts are located, or how many users there are" (www.isc.org)

Nevertheless FW notes that it is likely that their variable, HOST, is at least somewhat correlated with the relative quantity of host sites in each country. For example, even if a host site with a Bolivian top-level domain name is located in the USA, it is likely that the content of the web site is aimed at Bolivians. Thus, the number of "Bolivian" sites, regardless of physical location of the computers, should to a large extent reflect the "wiredness," or cybermass, of Bolivia.

In a series of gravity regressions, including extensive robustness and sensitivity testing, FW find no robust relationship between the internet and total trade in 1995 and 1996. However, from 1997 onwards, the internet shows a positive, increasing and statistically significant impact on the global pattern of trade flows. As predicted by the theoretical model, the effect of the internet is felt primarily through exports, and those countries with relatively more internet presence also display less dependence on historical determinants of trade such as a common language. Perhaps more importantly for the case of Bolivia, the results suggest that the benefits of the internet may accrue disproportionately to poorer countries, and are certainly no less important for developing countries than for industrialized nations. In general, the empirical results of FW imply that a 10 percent increase in the relative number of web hosts in one country would have led to about 1 percent greater trade in 1998 and 1999.

The results from FW reinforce the importance of policies aimed at reducing the "digital divide" between industrialized and developing countries. There is systematic and statistically significant evidence that increased internet access can have positive effects on the exports of poorer countries, and the theoretical model strongly suggests that these movements should be welfare enhancing.

Thus, if developing countries such as Bolivia are limited in their access to the World Wide Web they will not be able to take advantage of the benefits accruing to wealthier countries, and the rise of the Net will therefore be associated in increased global inequality. On the other hand, the results from FW suggest that given sufficient access to the internet, the overall effect of the web should be to lessen historically determined

inequalities in trading patterns and to increase export opportunities for developing countries, thus reducing global inequality.

3. The Case of Bolivia

In this section we provide additional analysis of the case of Bolivia. In particular, we reproduce here some of the general evidence from FW (2000) that is most relevant for developing countries and show that these results do in fact apply to the specific case of Bolivia. We provide further figures on the relative extent of IT and web connectivity in Bolivia compared to other Latin American countries, and discuss importance of IT investment and Internet education initiatives for the future of Bolivia's international competitiveness.

Summary statistics on the total number of host sites and the number of host sites per 10,000 population by top-level domain name for the 56 countries in the sample are presented in the top panels of part A and B of Table 2. Between 1995 and 1997 the number of such host sites approximately doubles each year. In 1998 and 1999 this exponential rate slows slightly, but is still quite high. The lower panels of parts A and B of Table 2 present the same statistics for developing countries, defined as countries with 1995 per-capita income below $2,000. Table 3 presents the same information for Bolivia.

As Table 3 illustrates, there is a striking lag between Bolivia and most other LDC's in internet development. In particular the number of Bolivian host sites in 1999 is 632, which is a whole order of magnitude less than the average number of hosts for countries with per capita incomes under $2000/year. The per capita figures paint a slightly improved picture. Bolivia's average of 0.85 host sites per 10,000 persons is only about 40% of the sample LDC average of 2.1. Table 4 puts this situation into a better context, comparing Bolivia's figures of per capita hosts sites in 1999 with those from a selection of countries at different levels of development. Table 5 presents a further comparison of a variety of per capita IT measures with other Latin American countries and table 6 presents the simple correlation between these variables. As would be expected, per capita host sites is highly correlated with both per capita computers, telephone lines and mobile phones. As might be expected, all of these variables are correlated with per capita income. In particular, for the countries in the FW sample the simple correlation between per capita GDP and per capita host sites is 0.705 and

extremely statistically significant (i.e. p-value < 0001). Therefore it is not surprising that for these IT variables[2] Bolivia ranks quite low, with levels comparable to the small Central American nations

Table 2: Summary Statistics for Host Sites by Country Top-Level Domain Names

A. Total Host Sites

All Countries					
Year	N	Mean	Std Dev	Minimum	Maximum
1995	56	29770.64	54367.70	0	241191
1996	56	63456.91	112886.26	0	452997
1997	56	114035.04	193965.52	0	734406
1998	56	191086.11	329857.61	17	1226568
1999	56	266346.20	460465.73	25	1718935
Less Developed Countries					
Year	N	Mean	Std Dev	Minimum	Maximum
1995	13	150.23	190.20	0	569
1996	13	674.77	851.84	0	2351
1997	13	3114.77	5644.49	28	19739
1998	13	4637.46	6233.80	17	16930
1999	13	6501.62	7505.33	25	18538

Source: Internet Software Consortium (http://www.isc.org/)

B. Host Sites per 10,000 people

All Countries					
Year	N	Mean	Std Dev	Minimum	Maximum
1995	56	10.1364	18.5113	0	82.12
1996	56	21.1591	37.6408	0	151.047
1997	56	37.6222	63.9926	0	242.293
1998	56	63.0219	108.7900	0.0056	404.533
1999	56	87.0059	150.4180	0.0081	561.515
Less Developed Countries					
Year	N	Mean	Std Dev	Minimum	Maximum
1995	13	0.0512	0.0647	0	0.193
1996	13	0.2250	0.2840	0	0.783
1997	13	1.0276	1.8622	0.0092	6.512
1998	13	1.5295	2.0559	0.0056	5.583
1999	13	2.1238	2.4517	0.0081	6.055

2 No data was available on the number of computers in Bolivia

Table 3: Summary Statistics for Host Sites, Bolivia

Year	# Hosts	Hosts per 10,000
1995	0	0
1996	66	0.0950
1997	430	0.6045
1998	554	0.7612
1999	632	0.8487

Source Internet Software Consortium
(http://www.isc.org/)

Table 4: Per Capita Host Sites for Selected Countries, 1999

Country	Hosts per 10,000 population
Bolivia	0.85
France	97.87
UK	290.05
Portugal	55.17
Brazil	13.03
Paraguay	2.12

Table 5: Internet Infrastructure in Latin America

Country	Daily Newspapers (a)	TV sets (a)	Telephone main lines (a)	Mobile Phones (a)	Personal Computers (a)	Internet Hosts (b)	Scientists & Engineers (c)
Argentina	138	347	174	16	24.6	5.32	350
Bolivia	69	202	47	4	-	0.69	250
Brazil	45	289	96	16	18.4	4.20	165
Chile	100	280	156	23	45.1	13.12	364
Colombia	64	188	118	13	23.3	1.81	39
Costa Rica	99	220	155	14	-	12.14	539
Dominican Republic	34	84	83	8	-	0.03	-
Ecuador	72	148	73	5	3.9	0.9	169
El Salvador	50	250	56	3	-	0.34	19
Guatemala	23	122	31	4	2.8	0.079	99
Honduras	44	80	31	0	-	0.94	-
Mexico	113	193	95	11	29.0	3.72	95
Nicaragua	30	170	26	1	-	1.60	-
Panama	62	229	122	-	-	1.44	-
Paraguay	42	144	36	7	-	0.47	-
Peru	86	142	60	8	5.9	2.63	273
Uruguay	237	305	209	25	22	3.18	-
Venezuela	215	180	117	35	21.1	2.06	334

a- per 1,000 people
b- per 10,000 people
c- per million people 1981-1995
Source World Development Report Knowledge for Development 1998/1999

The clear observation that Bolivia faces a severe relative IT handicap immediately brings up the question of what benefits Bolivia might accrue from increasing its web connectivity. However, it is not enough to say that that would be a good thing: buying computers, installing phone lines and training personnel is costly and uses valuable scarce resources that might otherwise be used to construct schools, roads and other socially beneficial activities. It is beyond the scope of this paper to provide a complete cost-benefit analysis of "getting wired," but we can attempt to contribute towards this goal by providing some kind of idea of the trade increases which have accrued to developing countries generally from the Internet, and determining whether or not Bolivia is likely to enjoy the same level of benefit.

In table 7 we present the results of our gravity model of trade including past trade volumes from 1995. Including a lagged dependent variable provides a control for many unobservable characteristics and is thus our preferred overall model from which we derive our final empirical estimates. In addition, we add to the basic specification a dummy variable for Bolivia and the Bolivia dummy interacted with our HOST variable. If we do not control for past trade values, the Bolivian dummy variable is negative and statistically significant[3], indicating that on average Bolivia has less trade than would be expected taking into account GDP, population, distance to trading partners, language and colonial links and free trade agreements. However, in the results presented in table 6 the lagged dependent variable captures this fact and the single Bolivian dummy is not statistically significant.

Most importantly, the coefficient estimate on the HOST variable is identical to the analogous results in FW, and the interaction variable of the Bolivian dummy and our HOST variable is not statistically significant. This result indicates that there is nothing systematically different about Bolivia that differentiates it from other countries when it comes to the relationship between Internet hosts and international trade. In other words, we have found no evidence that Bolivia would not receive the same benefits as any other country for an increase in Web connectivity.

Having established that the FW results can be generalized to the specific case of Bolivia, tables 8 and 9 are reproduced here directly from FW. The results from table 8

3 These results are available from the author but are not reproduced here to save space.

show that an increase in relative host sites benefits poorer countries at least, if not more, than it benefits rich countries In particular, when we interact our HOST variable with dummy variables for rich-rich, rich-poor, and poor-poor country trading pairs we find that the largest coefficient estimates are for poor-poor country pairs, followed by rich-poor and finally, with the smallest estimates of the trade effects of a relative increase in hosts, are the rich-rich country trading pairs The differences between the coefficient estimates are not large, but the pattern is similar over the sample period and is consistent with FW's theoretical results which imply that the benefits of the Internet will accrue to those countries who historically had fewer trade ties Thus, a conservative conclusion from these results is that the Internet plays at least as important a role in developing countries, and thus by association in Bolivia, as in industrialized countries In other words, the Web is not intrinsically an exclusive club enjoyed only by the rich.

In table 9 RW interact the HOST variable with dummies for a common language and colonial ties The theory predicts that the Internet will make such ties less important in determining trade patterns, and indeed we find that the coefficient estimates on the interaction variables are negative, and statistically significant for the Language interaction A possible interpretation of the language interaction result is that perhaps as English becomes something close to a universal language of the Net, having a common native language with your trading partner is becoming less important than simply knowing English Data limitations preclude us from testing this hypothesis directly, but the policy implications for English-language training are clear It is common sense as well to realize that to take the fullest possible advantage of any given access to the internet, a command over written English is a huge advantage

If the empirical results presented in table 7 are taken naively at face value, the one-order of magnitude difference between the quantity of Internet hosts in Bolivia compared to LDC's in general implies that if Bolivia increased its web connectivity to the average of the poorer countries, it's total trade would approximately double[4] We wouldn't wish to push these particular implications of the results quite this far, however the true functional form of the relationship may not be log-linear over all the range, and in addition it is technically incorrect to attribute dynamic causal-relationships to a cross

4 The FW results imply that a 10% increase in relative host sites in one country would increase total trade by approximately 1% Thus a one order-of magnitude increase (i e 10 times increase) in host sites would imply an increase in total trade on the order of 100%

section correlation. Nevertheless it is probably not an exaggeration to conclude that the potential gains, in terms of increased trade, of increased connectivity to the Web could be very large for Bolivia.

4. Conclusions

In any discussion of the potential benefits from increased internet access it is important to mention dynamic considerations. The results presented in FW and in this paper are inherently static in nature. However, there are strong reasons to suspect that some of the most important benefits from investment in knowledge-intensive infrastructure come in the form of dynamic returns. In particular the evidence seems quite convincing that there are significant externalities to education and to knowledge generally, and thus increasing returns to these kinds of investments at the macro-economic level. Better educated people tend to migrate to areas where the average level of education is relatively high – the opposite of what we would expect if there were decreasing returns. If we accept this argument made in much of the endogenous growth literature the impact of the Internet is likely to be three-fold. First, there will be the immediate static impact of increased trade via the channels explored here and in FW. Second, there will be dynamic benefits accrued via increased technological transfer, increased incentives to innovation provided by the larger market, and the subsequent increased returns to schooling – all of the dynamic returns identified in the trade literature of the last 10 years. Third, the growth of the IT sector should generate domestic returns internally that are complementary to the processes instigated by the increased trade.

The endogenous growth literature also hints to a hidden danger of not catching up quickly in terms of access to the international technological frontiers. In particular, due to the increasing returns referred to above, these models predict that initial advantages can translate into an ever increasing advantage, with no strong forces towards convergence at play. Thus a high cost of not investing today in access to technology is not just the forgone benefits calculated above, but also the fact that other countries' lead will be growing ever wider with the chances of catching up in the future getting slimmer each year.

Thus, the message of this paper is at once foreboding but at the same time quite heartening. As we have briefly discussed, many of the models in the endogenous

growth literature can imply that developing countries without first-mover advantage may fall further and further behind in the global national income distribution On the other hand, however, FW and this paper have shown that poor countries can derive a significant benefit from investment in the IT sector and the subsequent increased connectivity to the Internet In fact we have shown that the impact for poor countries is at least as great as it is for richer countries and can be quite significant

Table 6: Correlation* between IT Measures across Latin America

TV	0.485					
	(0.04)					
	18					
Telephones	0.736	0.727				
	(0.00)	(0.001)				
	18	18				
Mobile phones	0.828	0.516	0.772			
	(0.00)	(0.034)	(0.000)			
	17	17	17			
Computers	0.328	0.622	0.671	0.578		
	(0.35)	(0.055)	(0.034)	(0.080)		
	10	10	10	10		
Hosts	0.284	0.505	0.614	0.460	0.839	
	(0.25)	(0.033)	(0.007)	(0.063)	(0.002)	
	18	18	18	17	10	
Scientists	0.525	0.272	0.622	0.486	0.356	0.733
	(0.08)	(0.392)	(0.031)	(0.109)	(0.347)	(0.007)
	12	12	12	12	9	12
	Newspapers	TV	Telephones	Mobile phones	Computers	Hosts

*Note p values in parentheses followed by number of observations

Table 7: Gravity Model Including Initial Conditions and Bolivia Dummies

Dependent Variable: Log (Total Trade Volume)				
	1996 (1)	1997 (2)	1998 (3)	1999 (4)
Constant	-0.490	-2.758**	-0.057	1.153
	(-0.84)	(-4.12)	(-0.11)	(1.90)
$TRADE_{ij}$_95	0.857**	0.769**	0.541**	0.513**
	(47.41)	(35.77)	(32.68)	(28.09)
Bolivia	-1.120	2.087	-0.244	-0.592
	(-1.40)	(1.40)	(-0.22)	(-0.40)
GDPij	0.089**	0.122**	0.329**	0.440**
	(2.79)	(3.34)	(11.76)	(13.67)
POPij	0.013	0.065**	0.025	-0.006
	(0.69)	(3.21)	(1.52)	(-0.33)
DIST	-0.077**	-0.076*	-0.348**	-0.419**
	(-2.64)	(-2.02)	(-11.59)	(-12.20)
ADJ	0.088	-0.023	0.193	0.142
	(0.78)	(-0.18)	(1.54)	(1.07)
LANG	0.270**	0.312**	0.409**	0.462**
	(3.26)	(3.19)	(4.55)	(4.40)
LINK	0.096	0.141	0.222	0.188
	(0.63)	(0.78)	(1.20)	(0.98)
FTA	0.102	0.224*	0.074	0.132
	(1.43)	(2.45)	(0.93)	(1.45)
$HOST_{ij}$	0.032**	0.065**	0.072**	0.043**
	(2.94)	(4.62)	(6.73)	(3.46)
$HOST_{ij}$*Bolivia	0.059	-0.133	0.009	0.016
	(1.02)	(-1.48)	(0.15)	(0.20)
No. Obs.	1507	1507	1512	1514
R-squared	0.8858	0.8303	0.8522	0.8379

Please note: heteroskedasticity-consistent t-statistics in parentheses

** indicates statistical significance at 1% and * at 5%

Table 8: Gravity Model of Trade, Lagged Host

Dependent Variable: Log (Total Trade Volume)					
	1996[a] (1)	1997 (2)	1998 (3)	1999 (4)	1999 (5)
Constant	4.007**	-0.008	-1.464	1.939	0.481
	(2.90)	(-0.00)	(-1.23)	(1.83)	(0.40)
GDP_{ij}	1.133**	0.978**	0.821**	1.031**	0.959**
	(20.51)	(15.49)	(14.32)	(22.24)	(19.98)
POP_{ij}	-0.102*	0.019	0.079*	-0.038	0.026
	(-2.28)	(0.37)	(2.04)	(-1.13)	(0.65)
DIST	-0.854**	-0.773**	-0.812**	-0.867**	-0.839**
	(-13.53)	(-10.68)	(-15.32)	(-15.49)	(-14.96)
ADJ	0.546**	0.485	0.602**	0.512**	0.620**
	(2.56)	(1.53)	(3.16)	(2.68)	(3.14)
LANG	1.101**	0.990**	0.943**	0.936**	0.928**
	(8.19)	(7.03)	(7.30)	(6.96)	(6.81)
LINK	0.564*	0.585**	0.545**	0.473*	0.489*
	(2.52)	(2.66)	(2.58)	(2.10)	(2.14)
FTA	0.138	0.319*	0.165	0.193	0.223
	(0.98)	(1.97)	(1.25)	(1.43)	(1.64)
$HOST_{ij}$(-2)	0.034	0.087**	0.159**	0.086**	
	(1.62)	(3.46)	(6.23)	(4.21)	
$HOST_{ij}$(-4)					0.093**
					(4.99)
No. Obs.	1507	1507	1535	1537	1537
R-squared	0.6513	0.6369	0.7085	0.7071	0.7087

Source: Freund and Weinhold (2000)

Please note: heteroskedasticity-consistent t-statistics in parentheses

** indicates statistical significance at 1%, and * at 5%

a: HOST is lagged only one year in this regression

Table 9: Gravity Model of Trade, the Net's Effect on Rich and Poor Countries

Dependent Variable: Log (Total Trade Volume)					
	1995 (1)	1996 (2)	1997 (3)	1998 (4)	1999 (4)
Constant	5.702**	3.266*	1.207	0.913	2.688
	(3.94)	(2.07)	(0.70)	(0.65)	(1.77)
GDPij	1.207**	1.091**	1.024**	0.927**	1.029**
	(20.97)	(17.23)	(15.48)	(13.98)	(16.87)
POPij	-0.152**	-0.083	-0.040	-0.030	-0.104*
	(-2.98)	(-1.61)	(-0.76)	(-0.61)	(-2.03)
DIST	-0.887**	-0.858**	-0.811**	-0.840**	-0.875**
	(-17.13)	(-13.61)	(-11.27)	(-15.75)	(-15.88)
ADJ	0.596**	0.564**	0.390	0.586**	0.593**
	(2.87)	(2.68)	(1.23)	(3.04)	(2.99)
LANG	1.020**	1.109**	0.992**	0.919**	0.985**
	(7.76)	(8.21)	(7.15)	(7.07)	(7.03)
LINK	0.506*	0.540*	0.558**	0.490*	0.442
	(2.25)	(2.48)	(2.60)	(2.25)	(1.93)
FTA	0.080	0.162	0.270	0.084	0.126
	(0.61)	(1.13)	(1.67)	(0.64)	(0.95)
HOSTij _RR	0.007	0.058*	0.101**	0.155**	0.141**
	(0.35)	(2.10)	(3.23)	(5.54)	(5.22)
HOSTij _RP	0.025	0.067*	0.109**	0.172**	0.169**
	(1.05)	(2.21)	(3.37)	(6.21)	(6.05)
HOSTij _PP	0.033	0.031	0.104**	0.178**	0.189**
	(0.65)	(0.62)	(2.57)	(5.52)	(5.78)
No. Obs.	1515	1507	1507	1535	1537
R-squared	0.6764	0.6528	0.6383	0.7104	0.7150

Source: Freund and Weinhold (2000)

Please note: heteroskedasticity-consistent t-statistics in parentheses

** indicates statistical significance at 1% and * at 5%

Table 10: Gravity Model with LINK Interaction Terms

Dependent Variable: Log (Total Trade Volume)					
	1995 (1)	1996 (2)	1997 (3)	1998 (4)	1999 (4)
Constant	4.403**	2.684	0.510	-1.014	-0.266
	(3.36)	(1.78)	(0.32)	(-0.86)	(-0.21)
GDPij	1.181**	1.095**	1.028**	0.884**	0.956**
	(22.00)	(17.53)	(16.81)	(15.71)	(17.50)
POPij	-0.111**	-0.078	-0.028	0.033	0.007
	(-2.61)	(-1.69)	(-0.63)	(0.94)	(0.19)
DIST	-0.872**	-0.835**	-0.787**	-0.823**	-0.865**
	(-16.81)	(-13.05)	(-10.78)	(-15.33)	(-15.49)
ADJ	0.559**	0.547**	0.382	0.539**	0.501**
	(2.90)	(2.77)	(1.24)	(2.97)	(2.77)
LANG	2.494**	3.478**	4.108**)	4.080**	4.783**
	(6.40)	(6.77)	(6.26	(6.12)	(6.27)
LINK	-0.100-	0.720	0.967	2.209	1.806
	(-0.08)	(-0.44)	(0.50)	(1.25)	(0.86)
FTA	0.078	0.134	0.275	0.097	0.156
	(0.62)	(0.97)	(1.74)	(0.74)	(1.18)
$HOST_{ij}$	0.015	0.071*	0.106**	0.165**	0.145**
	(0.71)	(2.47)	(3.35)	(5.93)	(5.35)
$HOST_{ij}$*LANG	-0.096**	-0.135**	-0.159**	-0.156**	0.180**
	(-4.01)	(-4.94)	(-5.09)	(-5.06)	(-5.39)
$HOST_{ij}$*LINK	0.042	0.072	-0.017	-0.075	-0.056
	(0.53)	(0.84)	(-0.18)	(-0.91)	(-0.60)
No. Obs.	1515	1507	1507	1535	1537
R-squared	0.6773	0.6546	0.6404	0.7117	0.7140

Source: Freund and Weinhold (2000)

Please note: heteroskedasticity-consistent t-statistics in parentheses

** indicates statistical significance at 1% and * at 5%

Table 11: List of Countries

Algeria	Kenya
Argentina	Kuwait
Australia	Malaysia
Austria	Mexico
Belgium	Morocco
Bolivia	Netherlands
Brazil	New Zealand
Canada	Norway
Chile	Pakistan
China	Paraguay
Colombia	Peru
Denmark	Philippines
Ecuador	Poland
Egypt	Portugal
Finland	Saudi Arabia
France	Singapore
Germany	South Africa
Greece	South Korea
Hong Kong	Spain
Hungary	Sweden
Iceland	Switzerland
India	Thailand
Indonesia	Tunisia
Iran	Turkey
Ireland	United Kingdom
Israel	United States
Italy	Uruguay
Japan	Venezuela

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Natural Gas and Inequality in Bolivia*

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Summary

The increase in Natural Gas sales to Brazil in the coming years will bring about substantial changes in the Bolivian economy. In this paper, we use a general equilibrium model to simulate the changes that will occur in the Bolivian economy and will consider the distributional impacts that are likely to arise from these economic changes.

1. Introduction

Bolivia currently has 55 trillion cubic feet (TCF) of certified Natural Gas reserves and 957 million barrels of certified crude oil reserves [1]. This represents a dramatic increase in Bolivia's known natural resource wealth since 1996, where Natural Gas reserves fluctuated around 6 TCF and the oil reserves were economically insignificant.

The dramatic increase in reserves was brought about by an increase in exploration activity which in turn was made possible by two related events: 1) the signing of a Natural Gas export contract with Brazil promising the delivery of 7.1 TCF of Natural Gas

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1 Proven (P1) and probable (P2) certified reserves by 1 January 2003.

over 20 years, and 2) the capitalization of the state oil company, YPFB (Yacimientos Petroliferos Fiscales Bolivianos) which secured a large inflow of foreign investment to the sector.

The royalty value of these extra reserves amounts to several times Bolivia's GDP, so these discoveries represent a substantial positive shock to the Bolivian economy. The shock is so large that it has the power to significantly change the structure of the Bolivian economy for many decades to come. Not all these changes are likely to be positive. Evidence from around the world generally indicate that natural resource rich countries tend to under-perform compared to natural resource poor countries (e.g. Sachs & Warner 1995). Auty (1997, 1998) shows that between 1960 and 1990 per capita incomes of resource deficient countries grew two to three times faster than those of resource rich countries. Natural resource rich countries also tend to have stunted manufacturing sectors (Auty & Mikesell 1999), have less product diversification (Duncan 1993), be more prone to policy errors (Lal 1993), experience slower accumulation of skills (Wood & Berge 1997, Birdsall et al 1997), develop social and institutional capital more slowly (Auty 1998), suffer higher levels of corruption and unproductive rent seeking behavior (Tornell & Lane 1994; Karl 1997), and have a higher degree of inequality (Nankani 1979; Williamson 1997, Auty 1998, IDB 1998, Leamer et al 1999).

In this paper, we will use a Computable General Equilibrium (CGE) model to simulate some of the changes that are likely to occur in the Bolivian economy due to increased Natural Gas exports. We focus particularly on the changes in income distribution that are likely to arise from these economic changes.

The remainder of the paper is organized as follows. Section 2 provides a discussion of the channels through which natural resource abundance is likely to affect an economy and its growth potential. Section 3 discusses in detail how income distribution may be affected by natural resource abundance. Section 4 provides a short characterization of the Bolivian economy with respect to the distribution of income, the sources of government revenues, and the structure of exports. Section 5 describes a CGE model of the Bolivian economy, and Section 6 applies this model to analyze the major structural effects of an increase in Natural Gas exports. Sections 7 and 8 use the model to analyze how these structural changes will affect the distribution of income among different types of households. Section 9 concludes.

2. Natural Resources and Economic Growth. A Brief Review of the Issues

2.1 Stylized Facts About Natural Resource Abundance and Economic Development

Bolivia is a country with abundant natural resources. Total land area per capita is around 12 hectares per person, which makes Bolivia one of the most land abundant countries in the world.[2] In contrast to large areas of some of the other land abundant countries, which are covered with ice or desert, most of the land in Bolivia is usable. In addition Bolivia has very important natural resources, such as gold, silver, zinc, tin, gas and oil below ground.

This abundance of natural resources combined with its small population and small GDP places Bolivia squarely in the group of small resource rich countries relying heavily on hard minerals. As Table 1 shows, this group has performed worse in terms of per capita growth over the last 30 years than any other group of countries.

Table 1: Growth Performance of Different Natural Resource Endowment Categories, 1970-1993

	Number of countries	Per capita GDP 1970 ($)	Per capita GDP growth rate (%/year)
Resource poor			
Large	7	196	3.7
Small	13	343	2.1
Resource rich			
Large	10	574	1.3
Small			
Non-mineral	31	250	0.7
Hard mineral	16	304	-0.2
Oil exporters	8	831	0.8
All countries	85	361	1.1

Source: Auty (1997)

2 Number 19 out of 232 according to http://www.leksikon.org/html/dk/sort_stat_9.htm. Countries that are more land abundant per capita than Bolivia include Greenland, West Sahara, Mongolia, Australia, Canada, and Kazakhstan.

In the next sub-section we will discuss some of the reasons that have been advanced for the poor performance of natural resource abundant countries like Bolivia

2.2 Theories on Poor Economic Performance and Natural Resources Abundance

Several explanations for the unsatisfactory performance of resource-rich countries have been advanced,[3] and unfortunately these explanations complement each other rather than compete with each other The explanations can be divided into external factors, which are instigated by changes in the terms of trade and price volatility, and internal factors that are associated mainly with the mismanagement of natural resource rents

The first external problem is that the prices of primary products tend to be much more volatile than the prices of manufactured goods, which imply that the heavy reliance on just a few primary products subjects the country to high levels of volatility This may lead to growth collapses like the one experienced in Bolivia in the early 1980s when world tin-prices plummeted

The second external problem is that natural resource export booms tend to cause an appreciation of the exchange rate, which hurts the competitiveness of other export sectors, and thus may cause these sectors to shrink This is the commonly cited phenomenon known as "Dutch Disease" The non-boom export sectors generally suffer lowered investment and stunted growth rates as a result of the resource movements and relative price changes When the natural resource boom turns to bust, as the resource runs out or prices fall, the country is left with crippled alternative export sectors

Another theory that might explain poor performance in resource rich countries asserts that non-resource export sectors may be key sources of 'learning by doing' where more rapid productivity growth takes place (Matsuyama 1992, Sachs and Warner 1999) In this context, hampering growth in the manufacturing export sector through Dutch Disease entails a negative externality on dynamic economic growth

Apart from these problems linked to external economic processes, there are a number of internal problems caused by natural resource abundance

3 Auty (1998)

The first internal problem is that the availability of natural resource rents diverts efforts away from the process of productive wealth creation and into unproductive rent-seeking behavior, including corruption. This problem stems from the fact that the development of the natural resource sector changes the sectoral distribution of production to the detriment of other exporting sectors, such as modern agriculture. The effective result is a substantial reallocation of income within the economy. Often this includes the expansion of the public sector as easily taxed resource rents increase as a percentage of aggregate income. Even in the absence of corruption, the potential for dissipating national income with wasteful public sector spending increases.

The second internal problem is that the abundance of natural resources distracts governments from the need to develop human resources. As long as natural resources are abundant and can be used as a basis for growth and government revenues, there is less incentive to invest in human capital. This effect is reinforced by the fact that Dutch Disease tends to depress investment in high-skill exporting sectors, thus reducing investment in human capital formation (Gylfason et al. 1999). The result is an under-educated population without the skills and motivation to develop a dynamic manufacturing industry.

The third internal problem is that the mining of natural resources is usually a capital intensive activity with little employment creation and with few positive linkages to the rest of the economy (Hirshman 1958). The lack of positive linkages means that natural resource mining is likely to exist as a relatively isolated enclave within the economy and the likelihood that it spurs a virtuous circle of development spreading throughout the economy is extremely limited.

The fourth internal problem is that natural resource abundance tends to be associated with a more uneven distribution of income. This issue is the central topic of the present paper and will therefore be discussed in more detail in the following section.

3. Income Distribution and Natural Resources

Natural resources can affect a country's income distribution through several channels. One of the channels studied most in the literature is the human capital accumulation channel, where the basic assumption is that more investment in human

capital and higher levels of education is associated with more equality. Here we find two competing hypotheses about the impact of natural resources. The first hypothesis argues that the abundance of natural resources causes governments to neglect to invest in human capital, which implies that natural resource abundance would lead to more inequality (e.g. Birdsall *et al.* 2001, Gylfason 2001). The second hypothesis says exactly the opposite, namely that the natural resource rents soften the government's budget constraint and allows them to invest more in education (e.g. Davis 1995; Stijns 2001).

The empirical evidence on the effect of natural resource abundance on investment in education is mixed, if not contradictory (see Birdsall *et al.* 2001, Gylfason 2001, Davis 1995, Stijns 2001). The truth is probably that both of these opposing forces are simultaneously at work in any natural resource abundant country. Countries whose populations are divided into several competing factions (either by ethnicity or by high income inequality) are probably less likely to invest in mass education. Countries with more homogenous populations are more likely to reach the necessary consensus for high quality mass education (see Easterly 2001). Since Bolivia has both high ethnic diversity and high income inequality, there is a real danger that the first effect (neglecting education) might dominate.

Another channel through which natural resources affect income distribution is the distribution of rents. Since modern mining and hydrocarbon extraction tend to be highly capital intensive, a large part of the rents associated with extraction is likely to accrue to capital and only a small part to labor. Since capital owners tend to be rich and workers poor, this effect would tend to increase inequality. On the other hand, quite a large part of the rents is appropriated by the government, which creates scope for carrying out redistributive policies. Government programs and expenditures can influence inequality in a number of ways, some of which are pro-poor and some of which are not. Direct transfer payments could be used to augment the income of the poor. Such transfers, however, would have to continue indefinitely, and they thus create poor long-run incentives for growth. Instead government investment policies could be targeted at low-income earners, for example by improving infrastructure and basic services in poor neighborhoods. Current expenditure in health and education is perhaps the government activity with a redistribution objective that has performed the best. The most predictable impacts of government spending, however, also tend to be regressive.

High paying government jobs do not go to the neediest, nor do the contracts to carry public sector investment programs.

Although governments can directly affect income distribution somewhat through redistributive policies, the degree of income inequality is typically determined by the structure of the economy. Income inequality will more closely reflect the ownership pattern of capital assets in countries where capital commands a relatively large share of national income.[4] Similarly, where human capital occupies a larger share of aggregate income, the distribution of income will follow more closely the disparities in education and the attainment of skills. Economies that rely more heavily on human capital tend to be more equal as the distribution of human capital is generally more uniform than the distribution of land and capital. Nevertheless, human capital itself can be a source of growing inequality. A study by ECLAC (1997) shows how a growing disparity in the wage gap between high skilled and low skilled jobs has fueled income inequality in the 1990s in Latin America.

While experiences of other countries and economic theory can suggest possible outcomes, income distribution is an empirical question. Each situation stands unto itself. It is difficult to predict how Bolivia's newfound Natural Gas wealth is going to affect the income distribution over the coming decades, because the use of the government's part of the rents is going to be crucial. However, it is possible to assume that the Bolivian government will not change its investment and expenditure patterns significantly after the discovery of Natural Gas. After all, Bolivia has been exploiting exhaustible natural resources for centuries, and Natural Gas is no different from the rest. This allows us to focus on the other mechanisms through which the Natural Gas is going to change the distribution of income.

Besides redistribution, there are two fundamental sources of income disparities: a) asset ownership, and b) the return to these assets. Asset ownership is the result of complex historical, political, and economic processes, and we will not try to explain how Bolivia has arrived at the current situation. We will take that as historically given and instead focus on how Natural Gas is going to affect the return to assets and thus the income distribution.

4 This should not be confused with the capital-intensity of production. Highly capital-intensive production, for example manufacturing, is more often associated with low inequality.

To study changes in wage rates and returns to fixed assets, one must turn to economic analysis. There are no easy generalizations about the relationship between economic changes and income distribution. Furthermore, changes in wage rates and returns to capital occur in a general equilibrium framework. For this reason, we simulate these changes using a Computable General Equilibrium (CGE) model.

Empirical observations and economic theory do guide our analysis and suggest mechanisms for changing levels of income distribution. For an economy in equilibrium with well-functioning markets, wage rates and returns to capital will reflect the value of marginal production derived from those factors, subject to the available production technologies. One generally reliable supposition is that economies that rely more on human capital for production will be more equal, although important differences may arise out of different labor categories.

Similarly, a large capital component in production is another potential avenue for inequality. This is mediated by asset ownership and the complexities of supply and demand in input, output and factor markets.

Changing productivity and differential growth in factor supplies will alter the profile of income distribution. Where technological advances increase the productivity of labor, we will observe increasing wage rates. If capital stocks grow at a rate greater than labor participation rates, we would expect wage rates and labor incomes to increase. Returns to capital should drop while stocks are increasing, such that it would be difficult to predict the impact on capital income.

The logic of these interactions between production, factor markets and income distribution apply to the different sectors of the economy as well, such that each sector will have a different contribution to the overall income distribution profile of the country. Changes in the sectoral composition of an economy will therefore have implications for income distribution.

4. The Structure of the Bolivian Economy

This section will provide an overview of the structure of the Bolivian economy. It has been divided into three sub-sections discussing three different topics of importance for

the potential distributional impacts of Natural Gas exports: 1) employment and income distribution by labor types and sector of work, 2) government revenues from Natural Gas and other sources, and 3) international trade.

4.1 Employment and Income Distribution[5]

For the purposes of our distributional analysis, the economically active population of Bolivia has been grouped into the following six categories:

1. Rural small-holders
2. Agricultural workers
3. Non-agricultural workers
4. Urban informals
5. Employees
6. Employers

The first group of rural small-holders includes mainly traditional farmers who cultivate a small piece of land, to which they may or may not have a formal title. The average monthly income for a rural small-holder in 1999 was Bs. 244, which corresponds to about US$37/month.

Agricultural workers do not own land but work for hire, mainly on a daily or weekly basis, on other farms. Agricultural workers are often in short supply, which means that they can command a relatively high wage. The average monthly income of an agricultural worker is about Bs. 724, which corresponds to about $110/month or about three times as much as a rural small-holder.

Non-agricultural workers are the urban equivalents of agricultural workers. They are available for hire on a daily or weekly basis, and work primarily in the construction sector. Non-agricultural workers are generally not in short supply, which means that they command a lower wage than agricultural workers. The average monthly income for this group is about Bs. 651, corresponding to about $100/month. We assume that all agricultural and non-agricultural workers are unskilled.

5 This section is based on information from the 1999 MECOVI survey carried out by INE (Instituto Nacional de Estadística) and processed by Rainer Thiele and others at Kiel Institute of World Economics (see Thiele et al (2002)

Urban informals constitutes an important part of all economically active persons in Bolivia. They obtain a small and irregular income from informal services and petty trade. The average monthly income for this group is about Bs. 415, corresponding to about $63/month. This group contains most of the urban poor.

Employees are skilled, to a smaller or bigger extent, and are employed with a fixed monthly income by an employer, which may be private or public. The average monthly income for employees amount to Bs. 1,240, corresponding to about $188/month. There is quite a large variation in incomes in this group, depending on the level of education.

Employers own their own company and hire people to work for them. They earn on average Bs. 2,683 per month, which corresponds to about $407/month.

Summary information on employment and average monthly incomes for each group is given in Table 2.

Unskilled workers often work in agriculture during some periods of the year and in non-agricultural during other periods. This means that it is reasonable to assume perfect mobility between these two labor categories. There are also quite large flows of rural-urban migrants who come from the rural small-holder sector and join the urban informal sector. Thus we also assume perfect mobility between these two groups. Between all other groups we assume that there is no possibility of moving within our time-horizon.

Table 2: Employment and Income in Bolivia 1999, by Labor Category

	Employment (No. of persons)	Employment (%)	Average monthly income (Bs.)
1. Rural small-holder	1,409,313	39.5	244
2. Agricultural worker (unskilled)	66,672	1.8	725
3. Non-agricultural worker (unskilled)	296,451	8.3	651
4. Urban informal	878,203	24.6	415
5. Employee (skilled)	626,368	17.5	1,240
6. Employer	292,734	8.2	2,683
Total economically active population	**3,569,741**	**100.0**	**704**

Source: Thiele & Piazolo (2002)

Workers can move between sectors, however, depending on where the job-opportunities are and where the salary is most attractive. The distribution of skilled and unskilled workers across sectors in 1999 is given in Table 3.

More than half of all skilled workers work in the formal service sector (12), where they on average earn the low salary of about Bs. 779/month. All the other sectors offer monthly salaries that are two or three times higher, but employment opportunities are limited, except for the public sector, which employs almost 30 percent of all skilled workers.

Table 3: Employment and income in Bolivia 1999, by sector

	Skilled workers		Unskilled workers	
	Employment (Persons)	Income (Bs./month)	Employment (Persons)	Income (Bs./month)
1. Traditional agriculture	-	-	-	-
2. Modern agriculture	5,328	1,902	55,916	725
3. Coca sector	1,025	1,902	10,756	725
4. Crude oil and Natural Gas	8,096	2,866	9,322	1,268
5. Mining	3,668	1,856	21,362	1,053
6. Consumer goods	25,268	1,451	80,522	646
7. Intermediate goods	11,885	1,451	35,773	648
8. Capital goods	828	1,451	2,930	642
9. Electricity, gas and water	7,481	2,534	3,548	823
10. Construction	16,921	1,092	79,987	324
11. Informal services	-	-	-	-
12. Formal services	364,119	779	36,441	490
13. Public sector	181,749	1,945	26,566	1,339
Total	**626,368**	**1,232**	**363,123**	**664**

Source: Thiele & Piazolo (2002).

Unskilled workers are spread more evenly across sectors. A job in the public sector is particularly attractive for unskilled workers as it pays a substantial wage premium. The hydrocarbon and mining sectors also pay well, but the number of jobs in these sectors is quite limited. There are many jobs in the construction sector (10), but they only pay Bs. 324/month on average.

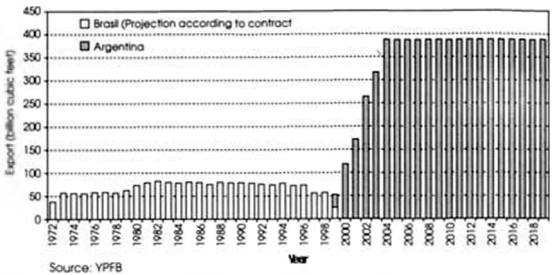
Traditional agriculture (I) and informal services (II) do not employ any workers. These two sectors are assumed to be run by rural small-holders and urban informals. Their average monthly income was presented in Table 2 as Bs. 244 and Bs. 415, respectively. Clearly rural small-holders and urban informals are among the poorest groups of the Bolivian society, which implies that we should be particularly concerned about them in our distributional analysis of the impacts of the Natural Gas boom in Bolivia. Among these two disadvantaged groups, the rural small-holders are by far the worst off, however. Almost all rural small-holders are officially considered poor, and most of them lack access to one or more basic services, such as electricity, clean water, health and education services.

4.2 Government Revenues

Bolivia has exported Natural Gas to Argentina for 27 years, but this ended in August 1999 when the export contract expired and Argentina declared itself self-sufficient in Natural Gas. The Natural Gas pipeline to Brazil was inaugurated shortly thereafter, initiating the exports of 7.1 TCF of Natural Gas to Brazil over the following 20 years. Figure 1 shows the actual exports to Argentina as well as the contracted exports to Brazil until 2019. It also shows that 1999 was a year with unusually low Natural Gas exports both in a historical context and compared to future expected export volumes. At the same time, the year 1999 saw the lowest level of oil prices for three decades (see Andersen & Faris 2001, Figure 1).

Despite the unusually low level of Natural Gas exports and unusually low level of gas and oil prices, hydrocarbon taxes accounted for more than 20 percent of government revenues in 1999 (see Table 4). Almost 2/3 of this revenue came from local taxes on gasoline, however. This part is not expected to increase dramatically over time. Royalties, however, are expected to increase dramatically as the volume of Natural Gas exports increase to comply with the contract with Brazil. At least a 7-doubling of the volume is to be expected, and the Natural Gas price (which is linked to world oil prices) has also increased substantially since 1999.

Figure 1: Natural Gas Exports from Bolivia (1972 - 2019)



Source: YPFB

Furthermore, profit taxes and remittance taxes paid by the companies operating in the hydrocarbon sector are expected to increase as these companies start profiting from the exports to Brazil. YPFB (2001) estimates that annual royalties and taxes from the Natural Gas exporting companies will amount to about $300 million if prices remain around the level they were in 2000. Andersen & Faris (2001) show that if prices vary as much over the next 20 years as they did during the previous 20 years, annual revenues due to Natural Gas exports to Brazil could beanywhere between $141 million and $1.1 billion. No matter how oil prices develop in the future, government revenues are going to become much more dependent on the hydrocarbon sector in the coming decades.

Table 4: The Composition of Total Government Revenues in Bolivia, 1999

	(million US$)	(%)
Profit taxes and value added taxes	986.48	47.48
from companies in the hydrocarbon production sector	120.30	5.79
from companies in the mining sector	5.33	0.26
Import taxes	108.39	5.14
Mining royalties	7.31	0.35
Hydrocarbon revenues	433.28	20.85
Gasoline sales taxes (IVA and IEHD)	273.78	13.17
Royalties	159.50	7.68
Other government revenues	542.38	26.18
Total	**2,077.85**	**100.00**

Source: Unidad de Programación Fiscal, Ministerio de Hacienda

Table 4 shows that the mining sector contributed virtually nothing to government revenues in 1999. This is despite the fact that mining was actually much more important than hydrocarbons in terms of exports. Mining products accounted for 38 percent of total exports in 1999, while hydrocarbons only accounted for 7 percent (see Table 5 below). The difference between the hydrocarbon sector and the mining sector in their contribution to government revenues is striking considering that both hydrocarbons and minerals are exhaustible natural resources, whose depletion ought to be compensated for through payments to the Bolivian society.

4.3 Trade and Openness

Rapidly increasing Natural Gas exports are likely to cause the exchange rate to appreciate. Any substantial appreciation of the real exchange rate will hurt other exporting sectors, so it is important to understand the present structure of Bolivian exports.

Table 5: The Structure of Bolivian Exports, 1999

	(million US$)	(%)
Minerals	397.1	38.09
Hydrocarbons	75.1	7.20
Soya	222.8	21.37
Wood & Wood products	72.6	6.96
Jewelry	47.4	4.54
Food Products	47.8	4.58
Others	710.0	17.26
Total	1,405.4	100.00

Source: UDAPE 2001, Dossier Vol 11

Figure 4 shows that the mining sector is by far the most important export sector. Minerals (mainly zinc, gold, silver, and tin) account for 38 percent of all exports. The export of soy beans from modern agriculture is also very important. That one product alone accounted for 21 percent of total exports in 1999. Hydrocarbon exports only accounted for 7 percent in 1999, but that share is expected to increase substantially during the next few years as explained in the previous section. Other significant export

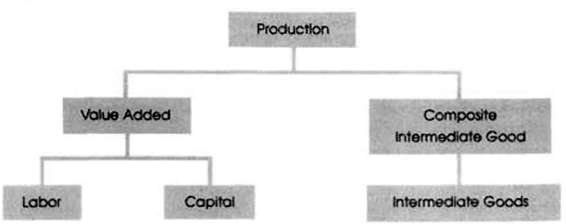
products include wood and wood products, which come from the intermediate goods sector, and jewelry and food products, which would come from the consumption goods sector.

5. A Model of the Bolivian Economy

The Computable General Equilibrium (CGE) model used for this study is a standard 12-sector recursively dynamic model. There is one capital category and five types of labor: skilled, unskilled agricultural, unskilled non-agricultural, smallholder, and urban informal. Amongst the labor classes, labor is mobile only between the two unskilled classes and between the smallholders and the informal sector. There are six household categories defined by the source of their income.

This model is constructed using a social accounting matrix (SAM) for Bolivia in 1997, developed by Thiele & Piazolo (2002). The authors of the present paper modified this SAM to estimate the sources and parameters for different fossil fuel taxes and royalties.

For the production sectors, output, prices and factor demands are all determined endogenously within the model. Production is portrayed with a multiple-stage nested function. Labor and capital are combined in a Cobb-Douglas relationship to produce value added. Value added and composite intermediate goods are pooled in a constant elasticity of substitution (CES) function. Intermediate inputs are used in fixed proportions in the creation of the aggregate intermediate factor. This formulation is constructed to reflect the flexibility in production choices for medium to long-term processes.



The utilization of capital and the five labor categories vary according to the sector, reflecting the factor use specification of the SAM. Capital is an input into production in all of the sectors, except for traditional agriculture, informal services and the public sector. Similarly, skilled labor is not used for traditional agriculture or the informal services sector. Instead, traditional agriculture uses only one factor, smallholder labor, which reflects an aggregate of household assets that are used in production. This factor is also used in the coca sector. The urban counterpart to the smallholder factor is informal labor. Unskilled labor is found in all sectors except traditional agriculture. Although unskilled labor is divided into two categories, urban unskilled and rural unskilled, we assume the labor can move from one to the other. Similarly, the aggregate household factors, smallholder labor and informal labor, are substitutes, allowing the possibility of migration between rural and urban areas.

Following standard practice, the model assumes profit maximizing behavior in each of the sectors.[6] Factors are hence employed in each sector such that the returns to each factor are equal to the marginal value product of the factor.

For the fossil fuel sector, production is fixed at the levels consistent with the contracts negotiated for Natural Gas exports and planned investments in the sector.

Although traditional agriculture and the urban informal sector use only informal labor and intermediates in production, these sectors are integrated into the larger economy in that these inputs are also used by other sectors. This formulation implies that the smallholder and informal sectors compete with other sectors for use of informal labor and act to absorb informal labor not employed in other sectors.[7]

The model is solved recursively over a fifteen-year time horizon. The model is run for each time period, after which the stocks of accumulated factors are updated before

6 The validity of this assumption for the traditional agricultural sector might be questioned given the portion of production that is destined for home consumption. Nonetheless, this sector will be sensitive to changing prices, although the model may misstate the sensitivity somewhat.

7 This simple structure for traditional agriculture and informal sectors means that these sectors do not accumulate capital over time, as the other sectors. Factor accumulation is only via an exogenously set growth rate, as for other labor categories. Incomes from households that rely solely on informal sector and traditional agricultural activities therefore do not include any returns from savings or investments. This might bias the results up or down, depending on the course of asset accumulation in these households.

the model is run again for the next period. The key aspect of defining the dynamic relationship in a macroeconomic model is the treatment of savings and investment behavior. In this model, aggregate investment is determined by national savings. First, private savings are fixed as a fixed percentage of income for households and corporations according to their observed marginal propensity to save. Government savings is determined endogenously as the remainder, after predetermined expenditures are subtracted from current revenues. In the absence of a solid empirical basis for estimating foreign savings levels, these are set exogenously at historic levels. Once this level of aggregate savings is determined, the allocation of investment is determined by relative profitability based upon current prices. This is an alternative formulation to fully dynamic models where consumers and producers make savings and investment decisions based upon perfect price information for all future periods, recognizing that decision-makers are imperfect predictors of the future. Macroeconomic closure in this model is achieved by allowing the real exchange rate to adjust to achieve equilibrium while foreign savings and the domestic price index are set exogenously. The model does not describe the financial sector of the economy so that savings, investment and capital accumulation are determined entirely via the real side of the economy.

The relationship between imports and domestically produced commodities, as well as the relationship between exports and domestically consumed commodities, are treated in the standard way for CGE models, using an Armington function for imports and a constant elasticity of transformation (CET) function for exports. This formulation entails the imperfect substitution between these different commodities which allows for two-way trade as in observed trade relations. The sectoral definitions of the SAM distinguish between industrial sectors that produce goods that are used primarily for consumption, intermediate production and capital investments. This permits the elasticity of substitution between imports and domestically produced goods for these different sectors to vary, and hence for scenarios to look at different taxation schemes and world price trends by import type.

The operation of labor markets follows De Santis (2000). Using the empirical observations of Blanchflower & Osward (1994) and others, a relationship between real wage rates and unemployment is specified, where higher wages coincide with lower unemployment. The empirical basis of the 'wage curve' mimics a labor supply curve

when specified in a simulation model.[8] Thus the labor markets operate on the principles of supply and demand in the model, rather than the often used simplifications of fixed wage rates or fixed labor supply curves.

The specification of production in the hydrocarbon sector differs from the other sectors of the economy, in that production is not allowed to respond to changing prices. Output of petroleum and Natural Gas is predetermined in the model by the currently projected exports under contract with Brazil and the associated investments in the sector.[9]

6. The Impact of Natural Gas Exports to Brazil

The potential benefits to be derived from an increase in natural gas sales concentrate primarily in providing a source of foreign exchange, a source of savings for carrying out investments (private or public), and as a source of revenue for the public sector. There are, however, substantial indirect impacts that will result from the large infusion of foreign exchange into the economy. In this section, we analyze the impact of Natural Gas on the Bolivian economy by comparing simulations generated by the CGE model. First, we compare the scenario that is constructed using the expected increase in Natural Gas sales (hereafter GAS) with a scenario that holds Natural Gas exports constant at 1997 levels (hereafter NO GAS). The apparent benefits from the increase in Natural Gas are substantial. Estimated annual growth is 2-3 percent higher for the period in which exports sales are growing rapidly (See Figure 2). In subsequent years, the higher annual growth rate disappears as the rate of growth drops back very close to the level predicted with no increase in gas sales. The estimated benefits are persistent as the economy continues to grow upon a larger economic base.

GDP is 10 percent higher after 16 years in the GAS scenario compared to NO GAS (see Figure 3). This increase in growth is brought about not only by the increase in fossil fuel sales – the demand-side impact – but also by an increase in national savings as a result of the petroleum sales, which leads to higher investment and larger capital stocks.

8 The demand for labor in this formulation still slopes downwards so that the productive sectors will hire less labor when wage rates are high. The supply side response brings more labor into the market when wage rates are high.

9 A full list of equations and the computer code for the model is available from the authors: Robert_Fans@Harvard.edu and landersen@grupointegral.bo.

– the supply-side impact. National savings and investment levels are estimated to be about 20 percent higher in the GAS scenario. Again, a substantial portion of this increase in national savings is drawn directly from the increase in Natural Gas revenues. An additional source of higher national savings is the result of cumulative growth. Higher investments lead to higher overall economic activity that brings on higher aggregate savings and investment and so on.

Figure 2: Increase in GDP Growth Rates due to Natural Gas Exports

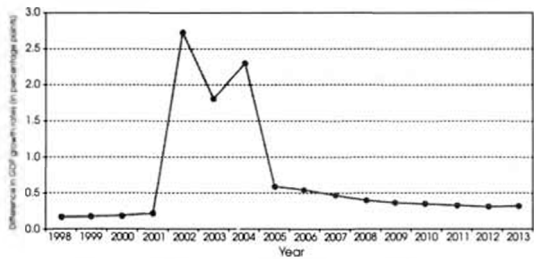
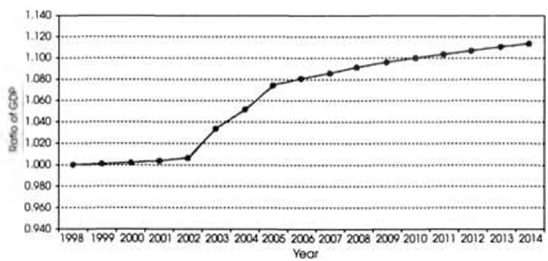


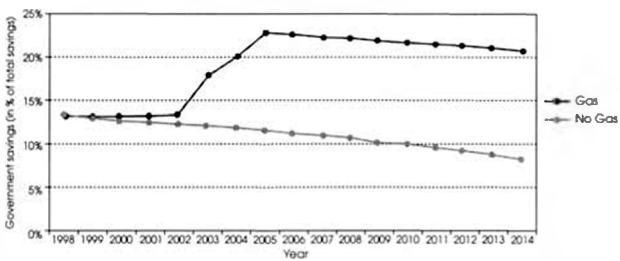
Figure 3: Increase in Total GDP due to Natural Gas Exports



A substantial portion of the increase in the national savings rate is made up of government savings, which climbs to over 20 percent of total national savings, as compared to about 12 percent without (see Figure 4). For better or worse, public investment will play a larger role in Bolivia. This topic will be explored in more detail later.

The increase in fossil fuel revenues accruing to the government also creates an increased dependence on natural resources in the public sector. Fossil fuel's contribution to government revenues increases from about 10 percent to about 20 percent. This stems not only from the increase in fossil fuel taxes destined to the government but also by a reduction in tax receipts in sectors that are negatively impacted by the economic changes. The increase in revenue presents the government with many options, including a reduction of other taxes that are more distortionary or an expansion of publicly financed investment projects. These possible benefits are partially counter-balanced by the concern of increased volatility in public revenues and of the increased dependence on fossil fuel revenues.

Figure 4: Government Savings in Percent of Total Savings, GAS versus NO GAS Scenario



The increase in GDP growth rates is also accompanied by a substantial change in the structure of the economy. The most dramatic change is the increase in the size of the petroleum and natural gas sector. The impacts of these economic changes on the other sectors of the Bolivian economy take place through a number of interrelated processes, the most important of which are changes in relative input and output prices, overall growth of the real economy and shifts in demand. The most immediate impact is in those sectors and segments of the economy with direct linkages to the fossil fuel sectors which benefit through higher demand for capital, labor and intermediate inputs. The portion of additional income earned through natural gas and petroleum sales that remains in Bolivia contributes to an expansion of the overall economy, increased consumer demand, higher aggregate savings and greater investment.

The relative price changes that occur in this open economy model are strongly influenced by movements in the exchange rate. The predicted appreciation of the real exchange rate brings about the classic relative price shifts associated with Dutch Disease. Exports will command lower prices in terms of the domestic currency, while imports become relatively less expensive. This tends to hurt the non-boom export sectors of the economy as they receive lower output prices. The non-tradable sector generally receives higher output prices. For the boom sector, in this case petroleum and natural gas, increased output may be partially offset by lower relative prices.

The simulations show an appreciation of the real exchange rate that peaks at a level that is almost 5 percent stronger than that of the NO GAS scenario. This real appreciation of the exchange rate is persistent, leveling off at a level 2 percent stronger. This constitutes a mild case of Dutch Disease – imports will be cheaper and will command a larger percentage of domestic sales and the profitability and revenues for export sales in domestic currency will be lower, suppressing the non-fossil fuel export sectors.

Changes in the relative prices of inputs is another important factor in the sectoral incidence of these economic changes. Those sectors that rely more heavily on imported intermediate inputs will tend to benefit from lower input costs, just as those that use more domestic intermediate inputs will experience relatively higher production costs.[10] Changes in the cost of capital and rising wages will also impact production costs, though these changes will tend to be more evenly distributed across all sectors. Finally, the overall growth of the economy has a positive impact on all the sectors, all else being constant, through an increase in consumer demand. The analogous increase in investment demand plays an important role in the impact on the different sectors of the economy, as rapid growth and the ensuing investment boom draws most heavily from a few sectors of the economy; the construction and capital goods sectors provide almost 88 % of the goods and services required for new investment.

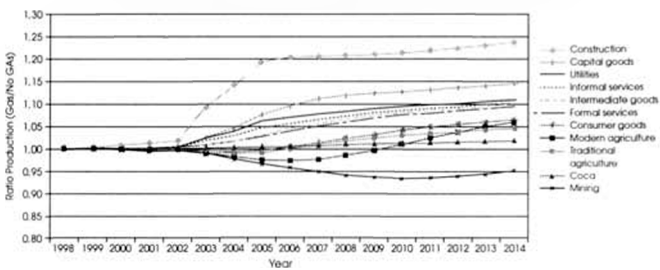
As seen in Figure 5, the export-oriented mining sector suffers the biggest short-term decline, followed by the modern agricultural sector. Consumer goods and traditional

10. We do observe, as expected, a shift in the composition of inputs with these price changes towards an increased use of imported inputs, although subject to a degree of rigidity as domestic and imported inputs are not perfect substitutes.

agriculture experience a similar decline in the first few years of the natural gas boom, though not as severe. These declines can be explained largely by the appreciating real exchange rate, which lowers export prices and subjects these sectors to increased competition from imports. All of these sectors also rely more upon domestic intermediate goods, which become more expensive, contributing to their relative decline.

Apart from the fossil fuel sector itself, the construction and capital goods sectors benefit the most from the changes, bolstered by the investment boom as well as declining prices for imported intermediate goods. The remaining sectors, including services, intermediate goods and utilities, are predominantly non-tradable and as such benefit from favorable relative price changes, offsetting any increases in production costs.

Figure 5: Changes in Sectorial Production due to Natural Gas Exports



The overall expansion of the economy helps all sectors. The recovery of the agricultural sectors in later years indicates that the impact of increased overall investment and growth in the economy may be larger than the impact of relative price changes due to the appreciating exchange rate. The only sector in which production is not ultimately higher is mining.

These economic changes bring with them difficult political questions. International experiences show that the negative impacts experienced in some sectors of the economy has in some cases led to government intervention to mitigate losses felt in the export and import competing sectors. Interventions to buffer short-term losses and to ease transition periods are understandable. However, these expenditures are difficult to

remove once introduced. Most agree that these types of support expenditures are tremendously wasteful and have contributed to the stagnation and inefficiency of industrial production in many countries.

The change in relative prices that accompanies a natural resource boom may constitute a permanent change in the economy. This in itself is not a problem. The advantages of a stronger real exchange rate – such as increased purchasing power through inexpensive imports – compensate for the disadvantages if the exchange rate properly reflects economic fundamentals. In this case, a more complete adjustment to the new economic context is preferable to maintaining an economic structure that is no longer competitive in the face of this new reality.

As one of the main exporting sectors in Bolivia, the mining sector is likely to suffer from a fall in profitability due to the Dutch Disease effects that arise from increased Natural Gas exports. Since the mining sector in Bolivia has strong labor unions that tend to be very vocal, the government is likely to experience a lot of pressure to compensate the growing group of unemployed miners. Rather than trying to artificially maintain the mining sector in Bolivia at any particular size through government subsidies, the government should help the miners make the transition to other sectors. This includes stimulating job creation in other sectors, perhaps simply by removing obstacles to the development of small and medium sized enterprises.

As we discussed in a previous section, economies that are highly dependent on natural resource face a set of particular challenges emanating from the windfall. Natural resource booms may cause governments to invest sub-optimally, but before returning to this point in Section 8, we now return our attention to the issue of income distribution, keeping in mind that the results of the scenarios presented in the following section might be overly optimistic.

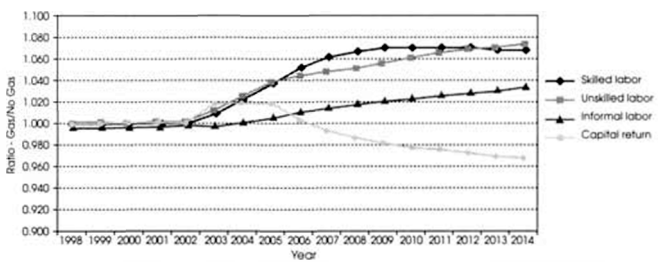
7. The Distributional Impact of Increasing Natural Gas Production

In order to assess the distributional impact of the increase in Natural Gas sales in Bolivia, we observe the predicted difference in wage rates and returns to capital that accompanies the resource boom. We also map the difference in income accruing to seven household and institutional categories. Starting with wages, we see from Figure

that wages increase for all strata. Given the strong aggregate benefits of the Natural Gas sales presented in the previous section, this is not a surprise. Driven by higher investment, increasing capital stocks push up the marginal productivity of labor which is translated into higher wage rates. This rise in relative wage rates is counter-balanced by a drop in the average return to capital. The falling returns to capital predicted by the model are the result of the relative abundance of capital in the assumed absence of productivity gains.

When predicted changes in wage rates are combined with predicted changes in employment of different factors, we can observe the total changes in factor incomes. Due to more investment and higher growth, employment of all factors is higher in the GAS scenario than in the NO GAS scenario, thus implying higher incomes to all factors (see Figure 7). However, the incomes to the two large groups containing most of Bolivia's poor people, rural small holders and the urban informal sector, do not increase as much as the incomes to the three richer groups (capitalists, skilled workers, and unskilled workers), thus implying an increase in income inequality.

Figure 6: Changes in Wage rates and Return to Capital due to Natural Gas Exports

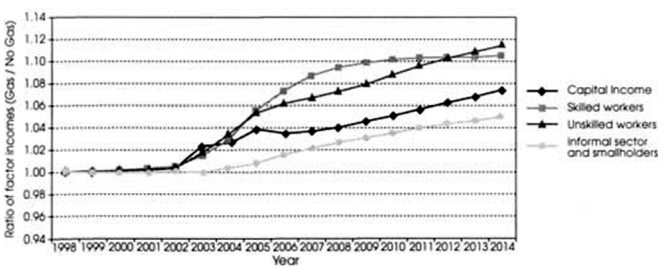


The answer to the question of how changing wage structures ultimately influence household income depends upon the structure of the labor markets, as well as the allocation of income between labor and capital. In particular, the distribution of income will depend on how different segments of the labor market react to changing wages and the degree to which barriers between different segments of the labor market and between employment in various sectors inhibit the movement of labor. For example, if

one were to assume that labor can flow freely between skilled, unskilled and informal labor segments, this would greatly overstate the fluidity of labor markets in Bolivia. On the other hand, to assume that all workers are locked into a segment understates the capacity to adapt to economic changes. In this analysis, we make two key assumptions that shape the results presented here. First, that labor from a given segment of the market can move freely between the different productive sectors. Second, that unskilled workers and those in the informal market can move between rural and urban markets, but not between these two segments of the labor market. There is no upward or downward mobility permitted. This assumption is supported by Andersen (2003) which indicates that the degree of social mobility in Bolivia is very low.

The skilled and unskilled workers fare comparatively better, as the sectors in which they are employed tend to expand at a greater rate than the informal sectors. However, this is not uniformly true across all sectors. There are comparatively fewer employment opportunities for unskilled agricultural workers, setting off a migration into urban and industrial sectors. A similar movement takes place away from the traditional agricultural sector to the urban informal sector. Again, while the results of the simulations exhibit comparatively fewer agricultural and mining jobs with the natural gas expansion, there is not an absolute decline in employment in the rural areas. Although this implies that the rural sectors may not be in the position to absorb the projected future growth in the labor pool, it does not suggest that current jobs will be lost there.

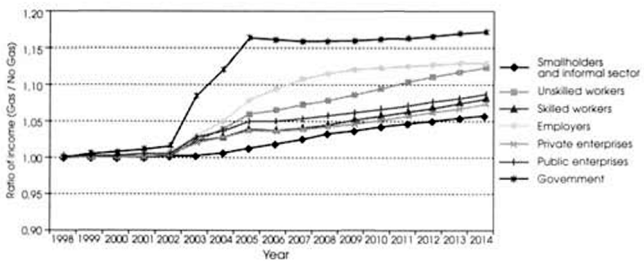
Figure 7: Changes in Factor Incomes due to Gas Exports



These observations are reiterated in looking at the distribution of income across households As we see in Figure 8, employers and unskilled workers fare the best with an expansion of Natural Gas Unskilled workers are employed in many of the sectors that benefit the most from the economic changes, particularly construction and services The smallholders and urban informal sector gain the least

Despite the drop in average returns to capital, the income accruing to capital increases as more capital is brought into production Hence income to employers, who earn their income from capital returns, displays significant increases This of course implies that the return to existing capital is lower and that only those who have invested in the more profitable sectors of the new economy experience an increase in income The owners of capital in agricultural and mining sectors will experience a drop in income in this context

Figure 8: Changes in Income due to Natural Gas Exports



Alternative assumptions regarding the fluidity of labor markets would produce different results If the option for rural unskilled workers and smallholder agricultural producers to move to urban opportunities were not there, the economic changes would affect these rural segments of society more severely As in the face of any significant economic change, it is the extent and rate in which producers and households are able to adapt to the new economic circumstances that determines the impact of the changes, either in terms of the damage from an economic shock or the benefits of an economic boom

Any measures that increase the ability of labor to move between segments of the labor market will reduce the disparity in the economic impacts of these changes between different segments of society. Were greater mobility assumed in these simulations, we would observe a shrinking of the informal sector as labor moves into skilled and unskilled segments of the formal sector.

In summary, Natural Gas exports could potentially increase incomes for all, alleviating poverty and creating more jobs. However, Natural Gas exports appear to benefit most the groups who initially earned higher incomes, causing increased inequality. This might be offset, however, if the government successfully invests its hydrocarbon revenues with redistribution as a specific goal.

8. A Less Optimistic Version of the Story

In this section we address the questions of income growth and distribution in a more sober light, recalling that natural resource dependence has been associated with poor growth. From the numerous potential problems associated with a large natural resource sector that we outlined earlier, we have only accounted for the issues related to Dutch Disease in the simulations of the previous section. These simulations therefore incorporate the most important benefits of natural resource exports: natural resource sales provide a source of foreign exchange, government revenues and funds for investment. As such, these scenarios might be best considered as an optimistic estimation of the benefits of expanding Natural Gas in Bolivia, better describing the potential benefits rather than the most likely result. The actual benefits will depend on the success in Bolivia of addressing the domestic policy challenges associated with the growth in Natural Gas sales.

The relatively sanguine results presented above are based upon a growth in savings and investment stemming from the increase in fossil fuel sales. The empirical evidence is not clear regarding the relationship between investment and natural resource sales. It is difficult, however, to imagine a scenario where aggregate investment could drop with an increase in fossil fuel export sales, except if this coincided with a decrease in growth. Otherwise, the diversion of resources into consumption and capital outflows would have to exceed the total increase in revenue. We are thus inclined to only seriously consider a decline in growth precipitating a drop in savings and investment, rather than the reverse.

Another limitation of this modeling approach is that we do not allow for endogenous productivity growth. Growth in this model relies solely upon factor accumulation. Given the lack of a strong empirical basis for estimating the determinants of productivity growth, we elected to exogenously set productivity growth. Furthermore, for simplicity, we set productivity growth at zero. There is considerable debate whether economic growth is better described by factor accumulation driving productivity growth, or productivity growth driving factor accumulation. It is undisputable that both are essential ingredients in modern growth. In this analysis, we are primarily concerned with the difference in economic performance between scenarios. The arbitrary treatment of productivity growth therefore only biases the results to the extent that productivity growth differs across different scenarios. Given the poor performance of so many economies that rely heavily on natural resources, it is natural to assume that natural resource extraction somehow inhibits productivity growth, and that including this impact would erode the estimated benefits of an increase in Natural Gas sales. An interesting topic for future research would be to disentangle the impact of natural resources on growth, accounting separately for the impact on factor accumulation and productivity growth.[11]

We proceed here by pursuing the question of capital accumulation. Given that we have discounted the prospect of a surge in natural resource revenues directly reducing aggregate investment, we introduce the possibility of poorly performing investments. To simulate the impact of bad investments, we analyze the results of the model using different values for a parameter that describes the efficiency of investment spending in creating new capital. The question at hand is whether all investment spending is equally effective at producing new capital, as is often assumed in analyses of growth and in estimating capital stocks (see Pritchett 2000). However, practical experience and a large body of anecdotal evidence points to the contrary. Investment spending is often misallocated, wasted, misappropriated or funneled into consumption. For the base scenarios reported earlier we followed the convention that one Boliviano of investment

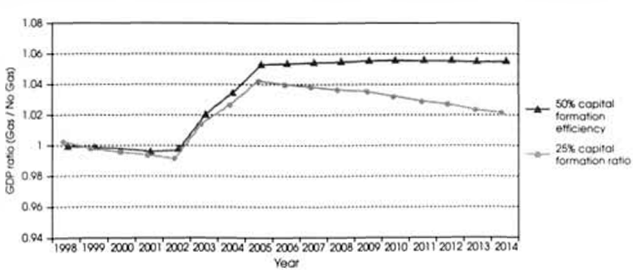
11 In scenarios not reported here, we do not find support for the theory that stronger productivity growth in the tradable sector can account for the poor growth associated with natural resources. Growth can be marginally improved by addressing the dynamic externality associated with reduced investment in the tradable sector resulting from Dutch Disease. This does not, however, begin to explain how taking advantage of natural resources could reduce growth. If this were to be true, then natural resources must reduce productivity growth not just penalizing the sector where growth might be stronger.

creates one additional Boliviano of capital. To create less optimistic scenarios, we consider the impact of setting this capital creation parameter at 0.5 and 0.25 for the amount of investment that originates from government fossil fuel revenues. Setting the capital creation efficiency parameter at 0.5 implies that half of all government investment derived from fossil fuel sales does not succeed in creating productive capital. In these scenarios, the economy still enjoys the full demand-side benefits of Natural Gas sales, but the supply-side expansion is reduced.

As can be seen in Figure 9, aggregate production is still higher with the increase in Natural Gas sales even with an acute waste of fossil fuel revenues by the government. The results of these scenarios also reflect the impact of shifting revenues into higher consumption or current expenditures – ineffective investment spending is comparable at the aggregate level to directing fossil fuel revenues to current consumption or to the inappropriate expropriation of public resources. The possibility that some of the natural resource revenues may leak abroad effectively reduces the size of the boom, but does not change the fundamental dynamics.

In conclusion, it takes more than a profligate squandering of public revenues to completely negate the benefits of natural resource exploitation. The implication of natural resources inhibiting growth – a notion that has considerable empirical support – is that we would observe a drop in GDP comparing the increase in Natural Gas sales to the scenario with no increase. We must look for different explanations if we are to support the notion that natural resource exploitation suppresses economic growth.

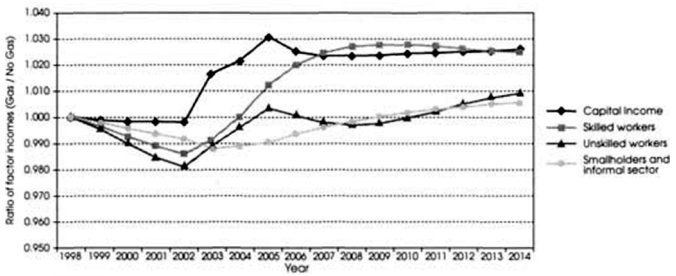
Figure 9: Increase in GDP with Natural Gas Exports but Inefficient Capital Formation



We see in these less-optimistic scenarios that the consideration of the distributional impacts from an increase in Natural Gas exports becomes more compelling. In Figure 10 we present the time path of the ratio of average incomes between the two scenarios for different segments of Bolivian society when 50 percent of government investments stemming from fossil fuel revenues are unproductive. We observe a longer period with depressed incomes for all segments of the economy, and the total income accruing to unskilled agricultural workers and smallholders recovering to the level of income without an increase in Natural Gas sales only after a decade. In this scenario, the influence of overall aggregate growth is not enough to offset the economic harm suffered by some segments of society as a result of Dutch Disease. In summary, unless the boost in fossil fuel production can bring about a substantial rise in investment and growth, the distributional implications become much more worrisome with the possible reduction in income for some of the poorest segments of the population.

The practical implications from this analysis are that the government of Bolivia must walk a delicate line between progressive social policy and adherence to stringent investment guidelines. Bolivia must avoid the poor investment performance experienced by so many countries in the wake of natural resource booms. To achieve this, the best prescription is to invest in carrying out strict project appraisal, ensuring adequate review and oversight and effectively recognizing the true scarcity value of this new-found capital. Smoothing public expenditures through a stabilization mechanism would help in this regard (Andersen and Faris 2001). Nevertheless, investments in human resource development, particularly health and education spending for the poorest segments of society, are essential. These investments are more difficult to evaluate within the confines of a traditional benefit-cost framework. Nevertheless, following fundamental project guidelines and the principles of accountability and transparency will reduce misallocation and waste.

Figure 10: Changes in Factor Incomes with Inefficient Capital Formation



9. Conclusions

The results of the simulations carried out in Sections 6 and 7 indicate that increasing Natural Gas exports has the potential for increasing wages and incomes for all the groups studied in this analysis. This is good for growth and poverty alleviation. Inequality does appear to increase, however. The smallholders and informal sector workers do not benefit to the same degree as formal sector labor, both skilled and unskilled, and those that receive capital returns. These results rely upon a healthy growth response to the surge in natural resource exports while experience indicates that this is far from inevitable. Less optimistic scenarios indicate that falling incomes amongst some of the poorer segments of Bolivian society is also a real possibility.

In general, it is crucial how the government spends its substantially increased revenues due to Natural Gas exports. If the government invests the money wisely, all major population groups should benefit from the Natural Gas boom, although some will gain more than others. If, in addition, the government invests the Natural Gas revenues with a focus on poorer segments of the country, poverty reduction could be substantial.

A large part of the Natural Gas revenues are going to accrue to state governments, especially in Tarija and Santa Cruz. The state governments occupy an ill-defined position between the central government and the municipal governments, where the responsibilities and priorities are not as clearly delineated. The administrative systems at the state level are also less prepared for managing large and volatile inflow of funds.

increasing the possibility that these funds will not be put to their best use Given this context, it would be prudent to make an effort to clearly articulate the goals and development strategies to which natural resource revenues will be directed The lessons and experiences from recent National Dialogues and the creation of the Poverty Reduction Strategy for the use of the HIPC debt relief provide a strong guide for strengths and limitations of such a process

Bolivia is in the position to carefully consider the best mechanisms for allocating and monitoring the use of the revenues derived from the increase in Natural Gas sales, building on past experience and the experiences of other countries to avoid the numerous pitfalls The question of earmarking natural resource revenues, instituting more stringent accounting guidelines and designing fiscal policy instruments such as a stabilization fund should be close to the top of the national agenda

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The Impact of Structural Reforms on Wages and Employment: The Case of Formal versus Informal Workers in Bolivia*

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Summary

This paper seeks to contribute to the ongoing controversy on the distributional effects of structural reforms in developing countries. To this end, we set up a small-scale macroeconomic model of a dual economy to capture the transmission mechanisms through which the deregulation of product and factor markets, the liberalization of the trade and FDI regime, and the privatization of public companies impact on the distribution of employment and wages between the formal and the informal sector. We empirically test the implications of our theoretical model in a detailed case study on the structural reform process in Bolivia since 1985.

1. Introduction

Rigidities in product and labor markets are considered to be at the root of poor economic performance in many developing countries. To achieve sustainable economic growth, international organizations, such as IMF and World Bank, and bilateral donors

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have advocated strict stabilization programs followed by comprehensive and far-reaching structural reforms. There is widespread consensus that these policy measures contribute to creating a favorable economic environment by restoring macroeconomic and fiscal stability. Critics, however, argue that rising inequality is also part of the package.

In this paper, we assess the validity of this claim focusing on the impact of structural reforms on the distribution of wages and employment between the formal and informal sector. In Section 2, we set up a small-scale macroeconomic model of a dual economy. The formal sector is modeled with (a) monopolistically competitive firms, (b) union-firm bargaining, (c) efficiency wage setting, and (d) employment protection. The impact of market imperfections on the labor-market equilibrium has long been discussed in the literature. More recently, the focus has shifted towards their interactions. Nickell et al. (1994) show that monopoly power of firms and bargaining power of unions jointly contribute to sectoral wage differentials. The link between union-firm bargaining and efficiency wages as complementary theories to explain sectoral wage differentials was explored by Garino and Martin (2000). By integrating all four types of market imperfections into a single model, we intend to proceed further on this path. We then apply the model to capture the different transmission mechanisms through which structural reforms impact on wages and employment in the formal and informal sector. Following Blanchard and Giavazzi (2001), we introduce structural reforms in a highly abstract fashion by discussing their impact on the model parameters which reflect the above mentioned market imperfections.

Due to the complexity of this issue, we argue that the most promising approach to gain further insights into the distributional effects of structural reforms is to carry out detailed country case studies. In this paper, Bolivia is chosen as object of analysis because it has implemented comprehensive and far-reaching structural reforms in a stable economic environment without of major exogenous shocks. We start this exercise in Section 3 by giving an overview of the structural reforms undertaken in Bolivia since 1985. Feeding the Bolivian structural reform process into our small-scale macroeconomic model, we then derive hypotheses on the post-reform trends in the distribution of wages and employment between the formal and informal sector.

Building upon Moensted (2000) and Carneiro and Henley (2002), we empirically test these hypotheses in Section 4 by estimating the formal employment share and by applying the decomposition methodology proposed by Oaxaca and Ransom (1994) to isolate the rent component of the formal wage. The data for the empirical analysis comes from seven biennial multi-purpose household surveys of the years 1989 to 2001. We finally summarize our theoretical and empirical findings and derive some policy conclusions in Section 5.

2. The Theoretical Model

2.1 The Basic Framework

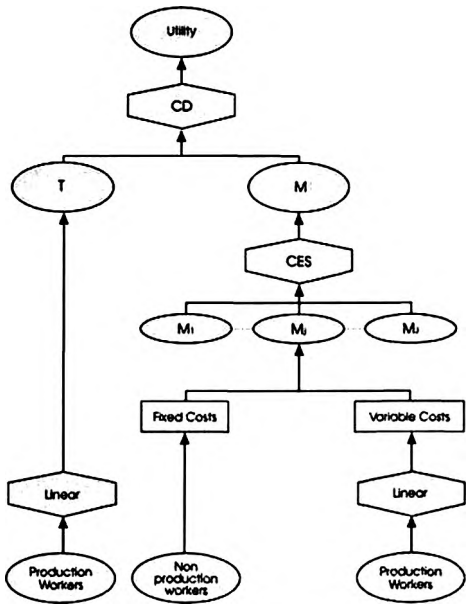
In order to capture the transmission mechanisms through which structural reforms impact on the distribution of wages and employment between the formal and informal sector, we set up a small-scale macroeconomic model of a dual economy (see Figure 1). The market structure of the informal sector, which produces the traditional good T, is perfectly competitive. In the formal sector, J monopolistically competitive firms produce J imperfectly substitutable varieties of the modern good M.

On the first stage of the utility maximization problem, individual solves

(1)
$$\max_{\{M_i, T_i\}} U_i = M_i^{\mu_i} T_i^{1-\mu_i}, \quad 0 < \mu_i < 1,$$
$$\text{s.t.} \qquad Y_i = P_M M_i + P_T T_i,$$

with $Y_i = \begin{cases} \text{Formal wage } W_{Mj} \text{ if } i \text{ is employed by firm } j \text{ in the formal sector} \\ \text{informal wage } W_T \text{ if } i \text{ is employed in the informal sector} \end{cases}$

Figure 1: Utility and Production Tree



allocating income to the consumption of M and T according to

$$(2) \qquad \frac{M_i}{T_i} = \frac{\mu_i}{1-\mu_i} \cdot \frac{P_T}{P_M}$$

The household loves variety in the modern sector and derives utility from J varieties of the modern good according to the CES utility function

$$(3) \qquad M_i = \left[J^{-\frac{1}{\eta}} \sum_{j=1}^{J} M_{ij}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, \quad M_{ij} \geq 0 \; \forall \, i,j, \quad \eta > 1$$

where η is the absolute value of the elasticity of substitution between the different varieties of the modern good and reflects the degree of competition in the formal sector. Maximizing utility subject to the budget constraint and aggregating over all households yields the demand for variety j

$$(4) \quad M_j = \left(\frac{P_{M_j}}{P_M}\right)^{-\eta} \cdot \frac{M}{J}$$

as a function of its own price P_{Mj} and the price index of the modern good

$$(5) \quad P_M = \left[\frac{1}{J}\sum_{j=1}^{J} P_{M_j}^{1-\eta}\right]^{\frac{1}{1-\eta}}$$

The output of variety j depends on the number of production workers $L^{\cdot}_{Mj}$, effort E_j and the level of technology A_j, and is given by

$$(6) \quad M_j = A_j E_j L^{\nu}_{M_j}$$

Effort is a function of the wage paid by firm j W_{Mj} relative to the expected outside wage Z. Following Summers (1988), we assume

$$(7) \quad E_j = \left(\frac{W_{M_j} - Z}{Z}\right)^{\gamma_j}, \quad 0 \le \gamma_j <$$

where the efficiency wage parameter γ_j measures the strength of the relationship between effort and wages of production workers. Additionally, firm j's workforce consists of $L^{'}_{Mj}$ non-production workers, who are assumed to receive the same wage as production workers.

Maximizing firm j's profits subject to its demand function (4) implies that firms can set prices as a mark-up on marginal costs

$$(8) \quad P_{M_j} = \theta_P \cdot \frac{W_{M_j}}{A_j E_j} = \frac{\eta}{\eta - 1} \cdot \frac{W_{M_j}}{A_j E_j}$$

In the informal sector, labor productivity of workforce L_T is constant and normalized to one, i.e.,

$$(9) \quad T = L_T$$

In perfectly competitive product markets, prices are set equal to marginal costs, which implies

$$(10) \quad P_T = W_T$$

where W_T is the wage paid in the informal sector

The economy is populated with L homogeneous and risk-neutral workers who supply labor inelastically In the informal sector, the labor market is atomistic, whereas in the formal sector, wages result from negotiations between unions[1] and firms. This assumption can be justified on the grounds that rents only accrue in the monopolistically competitive formal sector The wage bargaining takes place in a right-to-manage set-up,[2] where each firm negotiates with a single in-house union at the end of each period

The negotiation partners' stake in the wage bargaining is the difference in payoffs between a situation with and without an agreement Both negotiation partners gain a positive rent – the firm because of its market power in the product market, and the union because of its market power in the labor market Union j is assumed to represent only firm j's production workers Upon successful completion of the negotiations, union j gains a rent of

$$(11) \quad T_{U_j} = L^{\nu}_{M_j} \cdot \left(W_{M_j} - Z\right)$$

Firm j's stake in the wage bargaining is equal to its variable profits

$$(12) \quad T_{M_j} = L^{\nu}_{M_j} \cdot \left(P_{M_j} A_j E_j - W_{M_j}\right)$$

1 In order to be compatible to the standard terminology, we use the term "union" to refer to all labor-market institutions that strengthen the position of workers in wage negotiations

2 In other words, the two negotiation partners jointly determine the wage rate, while the firm unilaterally sets the employment level ex post

Assuming an asymmetric Nash bargaining solution, the wage is set to maximize the geometric average of the negotiation partners' rents from reaching an agreement

$$(13) \quad \Omega_{M_j} = \Gamma_{U_j}^{\beta_j} \Gamma_{M_j}^{1-\beta_j}$$

where β_j reflects the bargaining power of union j. Since firms can choose employment ex post, the negotiation partners maximize the Nash Maximand Ω_{Mj} by choosing the wage equal to

$$(14) \quad W_{M_j} = \theta_W \cdot Z = \frac{1+\beta_j}{\eta-1} \cdot Z$$

The formal wage is set as a mark-up θ_W over the expected outside wage

We assume that after the wage bargaining is completed at the end of period $t-1$, all jobs in the formal sector are newly allocated. Union members (hereafter referred to as *insiders*) who are not re-employed by their former employer expect either to find employment in one the other $J-1$ formal firms at the average formal wage W_M or to have to work in the informal sector at W_T. The expected outside wage is, thus, given by where $prob(L_{Mt}|L_{M\,t-1})$ is insiders' transition rate into formal employment.[3]

$$(15) \quad Z = prob(L_{M_t}|L_{M_{t-1}}) \cdot W_M + \left(1 - prob(L_{M_t}|L_{M_{t-1}})\right) \cdot W_T$$

Due to sector-specific human capital and employment protection, it is reasonable to argue that the risk of having to work in the informal sector in period t is not equal for all workers, but dependent on their sectoral affiliation in period $t-1$. More specifically, we assume that insiders enjoy a higher transition rate into formal employment than workers who were informally employed in period $t-1$, i.e.,

$$(16) \quad prob(L_{M_t}|L_{M_{t-1}}) = \psi \cdot prob(L_{M_t}|L_{T_{t-1}})$$

3 We choose to model re-employment probabilities rather than dismissal probabilities because they are easier to handle algebraically

where measures insiders' transition advantage. In this model specification, the expected outside wage of insiders is given by

$$(17) \qquad Z = \frac{\psi \cdot \frac{L_M}{L}}{1+(\psi-1)\cdot\frac{L_M}{L}} \cdot W_M + \left[1 - \frac{\psi \cdot \frac{L_M}{L}}{1+(\psi-1)\cdot\frac{L_M}{L}}\right] \cdot W_T$$

We consider a symmetric equilibrium of a closed economy, in which all individuals have identical preferences, and in which union bargaining power, the efficiency wage parameter, the level of technology and the number of non-production workers are equal for all formal firms.

Using these closure rules and collecting terms, we arrive at the employment share of the formal sector λ and the rent component of the formal wage θ

$$(18) \qquad \lambda := \frac{L_M}{L} = \frac{\mu \cdot (1-\gamma)}{1 + \frac{\beta}{\eta-1} + \mu \cdot \left(\frac{\beta}{\eta-1} + \gamma\right) \cdot (\psi - 1)}$$

$$(19) \qquad \theta := \frac{W_M - W_T}{W_T} = \frac{\frac{\beta}{\eta-1} + \gamma}{1-\gamma} \cdot \left(1 + \frac{\mu}{1-\mu} \cdot \psi\right)$$

2.2 Comparative-Static Effects of Parameter Changes

The labor-market equilibrium depends on five model parameters: the degree of competition in the formal sector η, the union bargaining power β, the efficiency wage parameter γ, the transition advantage ψ, and the income share spent on the modern good m, (see Figure 2). Absent any market imperfections,[4] formal workers do not receive a rent component ($\theta = 0$), and the employment share of the formal sector is equal to the budget share spent on the modern good ($\lambda = \mu$).

If we only consider monopolistic competition ($1 < \eta < \infty$) and union-firm bargaining ($\beta > 0$), we have a standard wage bargaining model with

4 That is, $\eta \to \infty$, $\beta = 0$, $\gamma = 0$ and $\psi = 1$.

$$(18a)\quad \lambda := \frac{L_M}{L} = \frac{\mu}{1+\frac{\beta}{\eta-1}}$$

$$(19a)\quad \theta := \frac{W_M - W_T}{W_T} = \frac{\frac{\beta}{\eta-1}}{1-\mu}$$

The size of the rents earned in the formal sector is determined by the price mark-up θ_p, and, thus, by the degree of competition η, (see (8)) The distribution of the rents between workers and firms depends on the union bargaining power β. Both model parameters drive a wedge θ_W between the expected outside wage of insiders and the formal wage (see (14)) As a result, the rent component of the formal wage is decreasing in η and increasing in β. Higher wages in the formal sector feed into higher prices of, and lower demand for the modern good. Therefore, the employment share of the formal sector is increasing in η and decreasing in β.

The efficiency wage parameter g enters the model in two ways. If firms determine the wage unilaterally ($\beta = 0$), the model converges to the standard efficiency model, in which wages are set according to the Solow condition,[5] and we arrive at

$$(18b)\quad \lambda := \frac{L_M}{L} = \mu \cdot (1-\gamma)$$

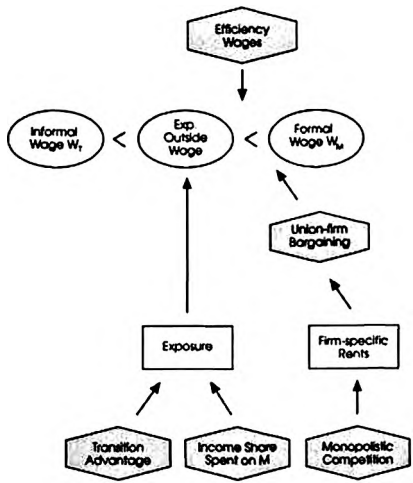
$$(19b)\quad \theta := \frac{W_M - W_T}{W_T} = \frac{\gamma}{(1-\gamma)} \cdot \frac{1}{(1-\mu)}$$

If efficiency wage setting and union-firm bargaining coexist, i e , $\gamma > 0$, $0 < \beta < 1$ and $1 < \eta < \infty$, the interactions between the two market imperfections have to be considered, too [6] Efficiency wage effects partly offset the costs of a pay rise through higher effort, thereby, reducing the elasticity of labor demand. As a result, firms are more willing to make concessions in wage negotiations and unions can push harder for a pay rise. The stronger the relationship between wages and effort, the higher is the wage mark-up θ_W, (see (14)) Hence, the rent component of the formal wage is increasing in γ. For the reasons discussed above, the reverse holds true for the employment share of the formal sector.

5 That is, the wage elasticity of effort $\varepsilon_{e,w_M} = \gamma \cdot \frac{w_M}{w_M - z}$ is unity in equilibrium.

6 For a more detailed discussion refer to Garino and Martin (2000).

Figure 2: The Wage-Setting Tree for Formal Workers



Insiders' transition advantage γ and the income share spent on the modern good μ do not represent labor-market distortions by themselves, but affect the labor-market equilibrium by interacting with union-firm bargaining and efficiency wage setting. Both parameters work through their effect on the expected outside wage. The higher ψ and μ, the higher is the disagreement point in the wage negotiations and, thus, the rent component of the formal wage. As a result, the formal employment share falls in ψ and rises only less than proportionally in μ.

2.3 Introducing Structural Reforms into the Model

Having characterized the comparative statics of the model, we can now turn to the distributional effects of structural reforms. The policy reforms can be grouped into five categories: (a) product-market deregulation, (b) labor-market deregulation,[7] (c) the

7 Since the model depicts a real economy, we do not address the distributional effects of capital market reforms.

liberalization of the trade regime, (d) the liberalization of the FDI regime, and (e) the privatization of public companies. Following Blanchard and Giavazzi (2001), these reforms are introduced in a highly abstract fashion. In the first step of the analysis, we discuss their impact on the model parameters h, b, g, y, and m (see Matrix A of Figure 3). Linking the outcome of this exercise to the comparative statics of Section 2.2, we then derive the impact of structural reforms on wages and employment in the formal and informal sector.

Figure 3: Impact of Structural Reforms on Wages and Employment

	η	β	γ	ψ	μ
DP	+				
DL		-		-	
IT	+			+	?
FDI	+			+	?
P	?	-	+	-	

	θ	λ
η	-	+
β	+	-
γ	+	-
ψ	+	-
μ	+	-

	θ	λ
DP	-	+
DL	- -	+ +
IT	- + ?	+ - ?
FDI	- + ?	+ - ?
P	? - + -	?+ - +

Notes: DP = Deregulation of Product Markets, DL = Deregulation of Labor Markets, IT = Liberalization of the Trade Regime, FDI = Liberalization of the FDI Regime, P = Privatization of Public Companies

Product-market deregulation comprises domestic policy reforms which increase the degree of competition in the formal sector. They include the abolishment of administrative market entry barriers and distortionary price and quantity regulations as well as the implementation of tougher antitrust enforcement, and are captured in the model by an increase in the substitution elasticity η.

Labor-market deregulation has an impact on two model parameters. First, weakening extension agreements and closed-shop arrangements, restricting the right to strike, and other measures to curb union bargaining power are modeled by a decrease in β. Second, measures to reduce employment protection, such as cutting the legal period of notice, and lowering redundancy payments and other administrative dismissal costs are reflected in a decrease in insiders' transition advantage ψ.

Formally speaking, the model depicts a closed economy. Yet, it is still suitable to analyze the distributional effects of the liberalization of the trade and FDI regime. Assuming that the production of tradable goods and the inflow of foreign capital is concentrated in the formal sector, opening up the economy – be it via international

trade or via foreign direct investment – should affect three model parameters First, the degree of competition in the formal sector and, thus, the substitution elasticity η, is likely to increase Second, the import of intermediate goods, the inflow of foreign capital, and the technology embodied therein, should increase insiders' sector-specific human capital, thereby, enhancing their transition advantage ψ Third, the impact on the income share spent on the modern good μ is undetermined Depending on the degree to which imports replace local production and to which foreign direct investors crowd out local competitors, demand for goods produced in the formal sector either rises or falls

Introducing privatization of public companies into the model is even more complex First, the impact of privatization on the degree of competition in product markets h is undetermined. On the one hand, Haskel and Szymanski (1993) argue that a shift from public to private ownership changes the objective function of the privatized entity Public companies are thought to pursue the interests of all stakeholders, i e , capital owners, workers, and consumers, while private firms confine themselves to profit maximization Consequently, private firms are more likely to abuse market power than public companies On the other hand, privatization is often accompanied by product-market deregulation This is done by substituting competitive market structures for state monopolies and by phasing out other types of administrative interference in the market Furthermore, when balancing the interests of consumers and producers, regulators tend to favor producers in the case of public companies, but consumers in the case of private firms Hence, antitrust rules tend to be more strictly enforced after privatization Second, privatization often goes hand in hand with de-unionization and the weakening of job security Both union density and co-determination are usually higher in public companies than in private firms Consequently, privatization can be modeled as a reduction in β^* Third, public employees frequently enjoy preferential treatment with respect to dismissal protection since (a) soft budget constraints in the public sector prevent mass layoffs in the first place, (b) legal rules governing the dismissal of public employees are more stringent, and/or (c) their application is more strictly enforced Hence, privatization should reduce ψ Fourth, privatization also influences workers' decision to provide effort While public companies tend to base remuneration and dismissal protection mainly on the principle of seniority, private

8 See for example, Haskel and Sanchis (1995)

companies are more likely to use a carrot-and-stick approach. On the one hand, they offer performance-related pay and fast-track careers for high achievers. On the other hand, they monitor closely to prevent shirking.[9] Privatization should, thus, strengthen the relationship between effort and wages. In other words, the efficiency wage parameter γ should increase.

In Section 2.2, we already discussed the impact of changes of the parameters η, β, γ, ψ, and μ on the formal employment share and the rent component of the formal wage (see Matrix B of Figure 3). Referring to these results, we can now derive the distributional effects of structural reforms (see Matrix C of Figure 3). Only in the case of the deregulation – be it in the product markets or in the labor markets – is the outcome clear-cut in that it causes an expansion of the formal employment share and a reduction in the rent component of the formal wage, either via an increase in the degree of competition, or via a decrease in union bargaining power and insiders' transition advantage. The distributional effects of the liberalization of the trade and FDI regime and of the privatization of public companies, however, are a priori undetermined and depend on the strength of the different transmission mechanisms.

In our view, the complexity of the distributional effects suggests this issue be explored further in detailed country case studies. We choose Bolivia as object of analysis for two reasons: Compared to other Latin American countries, Bolivia has (a) often been regarded as a "star reformer", and (b) enjoyed a period of economic stability without major exogenous shocks during and after the implementation of the structural reforms. Therefore, we expect that the structural reforms are the major driving force behind the trends in the distribution of wages and employment between the formal and informal sector in Bolivia. We start this exercise by giving an overview of the structural reforms undertaken in Bolivia since 1985.

3. Structural Reforms in Bolivia: An Overview

After a period of four years of political instability during which seven military and two civil government changed hands, followed by three years of political deadlock between president Hernán Siles Suazo and opposition-dominated Congress, the

9 See Goerke (1998)

Bolivian economy was at the verge of collapse. In order to overcome the economic crisis, the new president Victor Paz Estensoro performed a radical policy change in 1985. He first implemented a strict stabilization program, which enabled Bolivia to quickly regain its internal and external macroeconomic equilibrium [10]

The Nueva Politica Economica (New Economic Policy) also marked the start of a comprehensive and far-reaching structural reform process. Its objective was to restore sustainable economic growth as well as to enhance the allocative efficiency and international competitiveness of product and factor markets by replacing the out-dated development model based on market protection and state interventions by a free-market approach [11] As in Section 2, we group the policy reforms into five categories: (a) the deregulation of product markets, (b) the deregulation of labor markets (c) the liberalization of the trade regime, (d) the liberalization of the FDI regime, and (e) the privatization of public companies.

3.1 Deregulation of Product Markets

By deregulation of product markets we mean domestic policy reforms which aim at promoting efficiency and competition in the economy and at creating a "level playing field" for all market participants. In 1985, the prices of privately produced goods and services were liberalized and the prices of publicly produced goods and services were adjusted, thereby, correcting distortions in the relative prices. In the 1990s, the Bolivian government enacted a series of laws to regulate sectors with public monopolies: hydrocarbons (1990 and modified in 1996), utilities (1994), telecommunications (1995) and air transport (1998). Additionally an anti-trust regulatory system was created in 1994 with the objective to protect the rights of the consumers and to sanction anti-competitive behavior in these sectors.

Policy reforms in this category also include the modernization of the tax system. The main objectives of the tax reform were to increase tax collection and to enhance tax neutrality. In 1986, the majority of the 450 taxes were abolished and administrative

10 The Bolivian stabilization program is not covered in this study. For a comprehensive treatment of this issue see Sachs and Larrain (1998), and Antelo (2000).

11 For a more detailed description of these policy measures see Fundación Milenio (1998) and Antelo (2000).

procedures were simplified. Bolivia overhauled its income tax system introducing a flat tax rate of 10% on total income in 1987.[12] A corporate tax of 25% on ordinary profits and a tax on property, donations and heritage were introduced in 1994. The tax reform partially met its objectives. Tax collection (as % of GDP) increased from 5% in 1987 to 13% in 1998 (UDAPE var. iss.), and tax productivity[13] of the value-added tax increased from 4% in 1986 to 49% in 1998 (Lora 2001).

3.2 Deregulation of Factor Markets

The reform of the capital markets aimed at increasing the stability of the financial system and at creating incentives for the repatriation of capital which had fled the country during the first half of the 1980s. From 1985 to 1993, interest rates were gradually liberalized and the government significantly reduced its interference in lending decisions. Between 1987 and 1999, banking, insurance and stock market legislation were overhauled and modern institutions for the regulation and supervision of banks were put in place. Additionally, the reserve requirements were gradually reduced from 100% for foreign currency and 50% for national currency in 1985 to a uniform rate of 12% in 1998. In 2000, Bolivia established a deposit guarantee system and procedures to deal with failing financial institutions.[14] As a result of these reforms, the confidence in the Bolivian financial system was re-established. From 1990 to 1998, deposits increased from 16% to 41% of GDP and the transaction volume of the capital markets grew from 11% to 47% of GDP. Furthermore, several foreign banks established operations in Bolivia.

By contrast, a comprehensive and far-reaching labor market reform is still pending in Bolivia. So far, changes have been few and small in scope. In 1985, the government withdrew from interfering in the wage setting of the private sector. Freedom of contract and free collective bargaining between employers and employees were re-established. Wages, fringe benefits and dismissal protection of public-sector workers were reduced. However, Bolivia still boasts the highest expected dismissal costs (nearly 5 months of

12 The income tax rate as well as the value-added tax were increased from 10% to 13% in 1992.

13 The productivity of the value-added tax is calculated as the ratio between collection (as % of GDP plus imports minus exports) and the current rate.

14 Since 1987, there have been 8 liquidations of private banks (Antelo 2000).

pay in 1999) in Latin America, and due to inadequate labor dispute settlement mechanisms, lots of working days are lost to strikes each year (Lora 2001).[15]

3.3 Liberalization of the Trade Regime

Bolivia began to liberalize its trade regime by lifting the ban on foreign-exchange transactions in 1985, thereby unifying its foreign-exchange market. In 1986, the economy was opened up to international trade. A complex tariff structure in which tariff rates varied from 0% to 150% was replaced by a uniform tariff of 20% on all imports,[16] and most non-tariff barriers were eliminated. 1987 marked the start of Bolivia's efforts to actively promote and diversify its exports. It created the Instituto Nacional de Exportaciones (National Export Agency)[17] and producers of non-traditional products were given the right to deduct indirect taxes on raw materials, intermediate goods and services used in the production of exported goods. The import of those inputs was exempted from all other taxes and tariffs in 1990, and Zonas Francas (Special Economic Areas) were created in 1992, which offered tax incentives for the manufacturing of exported goods. At the end of the 1980s, Bolivia also began to reorganize its international trade relations. It negotiated bilateral preferential trade agreements with its mayor trading partners. The country became a member of GATT and joined the MERCOSUR as an associate member in 1997.

Table 1: Post-Reform Exports in Bolivia

	1986-1988	1989-1991	1992-1994	1995-1997	1998-2000
Exports of goods and services (% of GDP)	19.91	22.25	20.26	22.08	18.21
thereof:					
Mining	37.74	45.04	45.82	41.27	37.01
Hydrocarbons	44.70	26.31	13.11	11.12	10.32
Non-traditional	17.56	28.66	41.08	47.61	52.67

15 For instance, there were strikes in 189 out of 260 working days in the city of La Paz in 2000 (Escobar/Vásquez 2002).

16 In 1990, the uniform tariff rate was further reduced to 10%, and later the tariff rate for capital goods (but not for consumer goods) was set at 5%.

17 In 1998, this agency was replaced by the Centro de Promoción Bolivia and its tasks were expanded to foreign direct investment and tourism.

	1986-1988	1989-1991	1992-1994	1995-1997	1998-2000
Imports of goods and services (% of GDP)	24.28	24.68	28.22	27.94	28.36
thereof:					
Industrial Countries	51.47	53.19	55.56	55.86	51.40
Comunidad Andina	2.46	3.71	6.33	8.54	7.71
MERCOSUR	39.06	37.43	31.56	29.16	32.39
Other Developing Countries	7.01	5.68	6.55	6.44	8.50
Trade Balance (% of GDP)	**-4.37**	**-2.43**	**-7.96**	**-5.86**	**-10.15**

Source: Own Calculations based on UDAPE (var iss.), World Bank (2002), IMF(var iss.)

Table 1 shows the impact of the liberalization of the trade regime. In contrast to other Latin American countries, the post-reform export performance of Bolivia is rather disappointing. Rising exports in non-traditional exports were counteracted by falling exports in hydrocarbons. Taken together, Bolivia experienced only a modest rise in its export-to-GDP ratio rise after opening up to international trade. Even worse, the regional economic downturn (especially in Argentina and Brazil) in the wake of the Russian Crisis in 1998, pushed the export-to-GDP ratio even below its pre-reform level. Only with respect to the diversification of its exports did Bolivia make considerable progress.

The imports seem to have responded with a considerable time lag to the liberalization of the trade regime. In the early 1990s, however, the 3-year average import-to-GDP ratio jumped by almost four percentage points and has remained there since.[18] As concerns, the origin of imports, the Comunidad Andina and industrialized countries gained market shares at the expense of the Mercosur and other developing countries till 1997. In subsequent years, the trend was reversed.

3.4 Liberalization of the FDI Regime

Bolivia dismantled most restrictions on foreign direct investment. The Ley de Inversiones (Investment Act) of 1990 strengthened the rights of foreign investors by providing guarantees against non-commercial risk as well as equal treatment for domestic and foreign investors. This law also created the regulatory framework for international joint-ventures and settlement mechanisms for cross-border commercial

18 As a result, the trade balance of Bolivia first improved but later deteriorated relative to the pre-reform level.

disputes. It guaranteed free currency convertibility, free import and export of goods, services and capital, and free remittance of profits. Furthermore, Bolivia joined multilateral investment agreements such as the Multilateral Investment Guarantee Agency (MIGA), the International Center for Settlement of Investment Disputes (ICSID) and the Overseas Private Investment Corporation (OPIC), and it negotiated bilateral double-taxation agreements with several European and Latin-American countries.

Foreign direct investment boomed in Bolivia in the 1990s, as evidenced by the quintupling of the FDI-to-GDP ratio (Table 2). The removal of the obstacles to FDI was necessary but not sufficient for this success story. The main driving force for both the volume and the sectoral composition of FDI was that Bolivia offered new investment opportunities through the privatization of public companies, thereby, channeling large FDI flows into telecommunications, hydrocarbons, transport, and utilities.

Table 2: Post-Reform Foreign Direct Investment in Bolivia

	1992-1994	1995-1997	1998-2000
FDI, net inflows (% of GDP)	2.0	7.2	10.9
thereof:			
Mining	38.4	11.2	3.3
Hydrocarbons	36.4	39.7	47.5
Others	25.2	49.1	49.2

Source: Own Calculations based on UDAPE (var iss.), World Bank (2002), INE (2003), Antelo (2000).

3.5 Privatization of Public Companies

In 1985, there were more than 170 public companies in virtually all sectors of the Bolivian economy, ranging from utilities, telecommunication providers and airlines to cotton spinning plants, sugar refineries and hotels (Antelo 2000). At the beginning of the structural reform process, Bolivia undertook efforts to rationalize and restructure these companies. For instance, Cooperación Minera de Bolivia closed several mines laying off more than 21,000 workers, and Corporación Boliviana de Fomento, a money-losing public holding for industrial and agro-industrial assets, was altogether dissolved to improve its management and supervision system. Under the strong pressure of the international financial institutions, Bolivia started an ambitious privatization process in the 1990s. The

Ley de Privatización (Privatization Act) of 1992 provided the regulatory framework for the disposal of public companies and other state-owned assets resulting in the privatization of 81 small and medium-sized companies for a total of 279 million US$ (Antelo 2000). In order to deepen and accelerate the privatization process, the Ley de Capitalización (Capitalization Act) expanded the scope of privatization to the six state monopolies in 1994, i.e., ENDE (electricity), ENFE (railway), ENTEL (telecommunications), Fundidora de Vinto (mining), LAB (airlines), and YPFB (hydrocarbons). Between 1997 and 1999, these public companies were privatized by (a) giving their employees the right to buy shares at preferential conditions, (b) offering 51 % of the shares to international strategic investors under the condition to invest additional capital in the business, and (c) entrusting the remaining shares to newly created pension funds to finance the Bonosol, an annual basic rent to all Bolivians over 65 years. All in all, Bolivia carried out privatizations the cumulative revenues of which represented 19.7 % of GDP in 1999 (Lora 2001).

3.6 Reform Indices

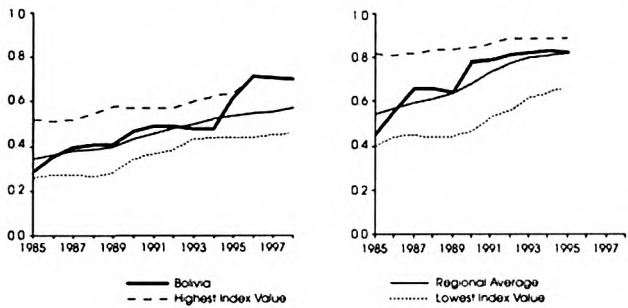
Morley et al. (1999) and Lora (2001) developed a set of reform indices, which can be used to compare the structural reform progress in Bolivia with other Latin American countries.[19] In line with the assumption that the primary objective of structural reforms is the pursuit of greater efficiency in the allocation of productive resources by eliminating or reducing distortions caused by government intervention, the indices attempt to measure the neutrality of government policies.

Figure 4 shows the overall structural reform progress of Bolivia between 1985 and 1995 in the case of Morley *et al.* (1999), and between 1985 and 1998 in the case of Lora (2001). By Latin American standards, Bolivia has been a "star reformer". Starting from a below-average general structural reform index in 1985, it had caught up to the regional average by 1986 and overtaken all other Latin American countries by 1996.[20]

19 See the above cited sources for a detailed description of the methodology used to construct these indices.

20 Since Morley *et al.* (1999) analyze the structural reform progress in Latin America only until 1995, the latter result cannot be checked with their index.

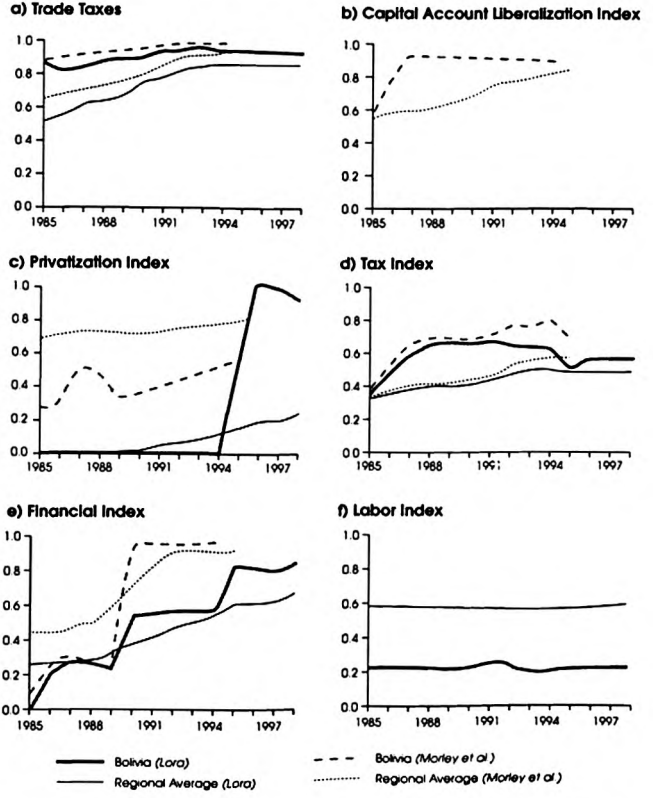
Figure 4: General Structural Reform Index of Bolivia between 1985 and 1998



Source: Authors' calculations based on Morley et al. (1999) and Lora (2001)

The six partial structural reform indices shown in Figure 5 break down this result for different policy areas. As concerns the degree of openness (Figures 5a and 5b), both the trade index and the capital account liberalization index demonstrate that already at the start of its structural reform process or shortly afterwards, Bolivia's trade regime was relatively liberal. However, over time the other Latin American countries nearly offset Bolivia's lead in this policy area. The privatization index (Figure 5c) shows that Bolivia started to privatize its public companies relatively late, but then carried out the most ambitious privatization program in Latin America. The Bolivian tax index (Figure 5d), which partially reflects progress in product-market deregulation, displays a more irregular behavior. Starting from slightly above average in 1985, the implementation of the tax reform put Bolivia ahead of most Latin American countries. Later the Bolivian tax index declined again and the country almost lost its favorable position. In the area of factor-market deregulation (Figures 5e and 5f), the financial and the labor index of Bolivia follow different time paths. As concerns the reform of the capital markets, the country switched from one of the least liberal to one of the most liberal regimes in Latin America. On the other hand, the Bolivian labor index fell far short of the average index value of the region throughout the entire observation period. This signifies that with respect to labor-market reforms, no progress has been made so far.

Figure 5: Partial Structural Reform Indices of Bolivia between 1985 and 1998



Source: Authors' calculations based on Morley et al. (1999) (Figures a-e) and Lora (2001) (Figures. a and c- f).

3.7 Hypothesis on the Distributional Effects of the Bolivian Structural Reform Process

Feeding this structural reform process into our theoretical model, we can derive the following empirically testable hypotheses on the post-reform trends in the distribution of wages and employment between the formal and informal sector in Bolivia. We expect to find an expansion of formal employment in the early years of the structural reform process. This is because the comprehensive product market deregulation in the second half of the 1980s facilitated the market entry into the formal sector, and the liberalization of the trade regime initially improved the trade balance, thereby increasing demand for goods produced in the formal sector. During the 1990s, however, the favorable employment trend is likely to have been reversed. There are three driving forces which should have contributed to a contraction of formal employment: (a) the deregulatory impulse in the product market seems to have weakened over time, as evidenced by a stagnant or even falling tax index after 1991, (b) the deterioration of the trade balance in the 1990s indicates that imports have increasingly replaced local production in the formal sector, and (c) since the inflow of FDI after 1995 mostly stems from the privatization of public companies rather than greenfield investment, it is unlikely to have increased the degree of competition and the demand for goods produced in the formal sector.

As concerns the rent component of the formal wage, there are two opposing driving forces in the early years of the structural reform process. Higher competition in the formal sector, jointly caused by the deregulation of the product markets and the liberalization of the trade regime, should have reduced the rent component of the formal wage. On the other hand, the initially positive response of the trade balance to the liberalization of the trade regime should have had the opposite effect. Later on in the structural reform process, we expect the rent component of the formal wage to have fallen due to increasing replacement of local production by imports.

4. The Empirical Model

4.1 Data and Methodology

The data to empirically test our hypotheses comes from seven multi-purpose household surveys collected by the Instituto Nacional de Estadisticas de Bolivia

(National Statistical Office of Bolivia): the Encuestas Integradas de Hogares (EIH) 1989, 1991, 1993 and 1995, the Encuesta Nacional de Empleo (ENE) 1997, and the Encuestas Continuas de Hogares (ECH) 1999 and 2001. From all respondents, we select those aged between 20 and 65 with strictly positive labor income[21] and a full information set on the employment and earnings characteristics. Due to the limited geographical coverage of some household surveys, the sample is further restricted to the departmental capitals of Bolivia and El Alto.[22]

The sample is divided into two groups: those employed in the formal sector and those employed in the informal sector. Our data set does not contain an explicit variable on the sectoral affiliation, but it is possible to construct such a variable as a combination of other personal characteristics. When asked about their occupational status, respondents can choose between seven categories: blue-collar worker, white-collar worker, employer, independent professional, self-employed, family worker, and domestic servant. We define employers and independent professionals as formal, and self-employed, family workers, and domestic servants as informal. As concerns blue-collar and white-collar workers, we consider them formal if they fulfill at least one of the following criteria: public-sector employment, fixed employment contract, social-security affiliation, union membership, or establishment size > 5 employees.[23]

Based on this sector classification, we estimate the employment shares of, and the mean log wage difference between the formal and informal sector. In our theoretical model of Section 2, we assume that labor is homogeneous and, thus, neglect differences in the endowment in schooling, job experience, and other wage-determining characteristics among workers.[24] In order to obtain an unbiased estimate of the rent

21 We use a narrow concept of labor income. It is defined as reported log monthly base salaries of dependent employees and log average monthly net earnings of self-employed, independent professionals and employers earned in their principal labor-market activity. Fringe benefits are not considered because, if at all, some household surveys collect only their incidence and type but not their monetary equivalent.

22 The EIHs 1991, 1993 and 1995 were only conducted in the departmental capitals and El Alto. The EIH 1989 additionally spans other urban areas, while the ENE 1997 and the ECHs 1999 and 2001 cover the entire country.

23 Due to changes in the questionnaires, not all of these sector-selection determinants are available for all years. The contract type is missing for 1989, the social-security affiliation for 1993, 1995 and 1997, and the union membership for 1989, 1991, 1995 and 1997.

24 For a theoretical model on the impact of structural reforms on the wage gap between skilled and unskilled workers see Andersen and Spatz (2003).

component of the formal wage (19), we have to correct the sectoral wage gap for the component which can be explained by the empirically observed differences in the mean endowment with these characteristics between formal and informal workers (endowment component). The standard way to do so is to apply the decomposition of Oaxaca (1973) (see Moensted (2000) for the case of Bolivia) or the decomposition of Oaxaca and Ransom (1994) (see Carneiro and Henley (2002) for the case of Brazil). The two methodologies differ only with respect to their hypotheses on how workers would be remunerated in the absence of rents. The competitive wage-setting mechanism is assumed to be like in the informal sector in Oaxaca (1973), and like in a unified labor market without sectoral segmentation in Oaxaca and Ransom (1994). Although the former methodology more closely mimics the assumptions of our theoretical model, we find the latter methodology more convincing from an empirical point of view.[25]

The Oaxaca-Ransom decomposition proceeds as follows. First, we run two sector-specific standard semi-log earnings regressions

$$(20) \quad \ln W_i^M = \delta^M Z_i^M + \varepsilon_i^M \qquad \text{and}$$

$$(21) \quad \ln W_i^T = \delta^T Z_i^T + \varepsilon_i^T$$

where the indices M and T stand for the formal and informal sector, respectively. Z are vectors of wage-determining characteristics, d are coefficient vectors, and e are normally distributed error terms. Additionally, we construct a vector of implied weighted average coefficients

$$(22) \quad \hat{\delta}^* = \Phi\hat{\delta}^M + (I - \Phi)\cdot\hat{\delta}^T \text{ with } \Phi = \left(Z^{M'}Z^M + Z^{T'}Z^T\right)^{-1}\cdot Z^{M'}Z^M$$

to represent the returns to the wage-determining characteristics that would hold in a unified labor market without sectoral segmentation. Based on the estimation results of (20) to (22), we then decompose the empirically observed difference in mean log wages between formal and informal workers according to

25. This is not to say that we do not put faith in our theoretical model. However, in order to keep it analytically solvable, we imposed some simplifying assumptions which do not qualitatively affect the distributional effects of structural reforms.

$$(23) \quad \ln \overline{W}^M - \ln \overline{W}^T = \hat{\delta}^* \cdot \left(\overline{Z}^M - \overline{Z}^T\right) + \left[\overline{Z}^M \cdot \left(\hat{\delta}^M - \hat{\delta}^*\right) + \overline{Z}^T \cdot \left(\hat{\delta}^* - \hat{\delta}^T\right)\right]$$

The first term on the right-hand side of (23) is the endowment component, which indicates how large the wage gap between formal and informal workers would be in the absence of labor-market segmentation. It takes a positive value if the average formal worker is endowed with more positively rewarded and less negatively rewarded characteristics than the average informal worker. The second term is the rent component. It is positive if formal workers enjoy a premium over, and informal workers sustain a discount on the unified rates of return $\hat{\delta}^*$.

The selection of workers into the formal and informal sector may not be random in that they may have a comparative earnings advantage in their respective sector. For this reason, both Moensted (2000) and Carneiro and Henley (2002) apply the two-step procedure proposed by Heckman (1976, 1979) to account for sample-selection bias. We argue, however, that this empirical model is not applicable for our purposes for two reasons. First, the identification of the Heckman two-step procedure is problematic since our data set does not contain variables which enter only the selection equation but not the earnings equations, i.e., variables which determine only the probability of being selected into formal employment but not wages. In this case, identification crucially depends on the assumption that the Mills ratio is sufficiently non-linear, which in our view is too weak a base for statistical inference.[26] Second, our theoretical model implies that not only the rent component of the formal wage but also the probability of being selected into formal employment is affected by rigidities in the product and labor markets. If we corrected for the time-varying sample-selection bias, we would be unlikely to capture the direct and indirect impact of structural reforms on the rent component of the formal wage.

4.3 Results

The sector-specific earnings functions (20) and (21) are standard in that they include spline functions for age (4 dummies with "20-24 years" being reference state), for education (8 dummies with "no or basic education incomplete" being reference state),

26 See Johnston and DiNardo (1997:450) on this issue. Moensted (2000) and Carneiro and Henley (2002) claim to have found such identifying variables. However, a closer inspection of their selection equations, casts considerable doubt on the validity of this claim.

and for job experience (3 dummies with "< 1 year" being reference state), as well as dummies for being female, being indigenous, and being in independent employment. Additionally, we control for log working hours and the log of the local poverty line, which we use as a proxy for the local price level.

Table 3 reports the regression results on the determinants of formal and informal wages for the years 1989 to 2001.[27] The returns to schooling are positive over the entire range of the educational spline function, as evidenced by that the coefficients are (with few exceptions) higher for higher educational categories. We also find that formal workers with 12 or more years of schooling (i.e., from "higher secondary complete" onwards) receive a higher skill premium than informal workers in the respective educational categories. The returns to age are hump-shaped. Additionally, they are consistently higher in the formal sector than in the informal sector. This could be due to that seniority considerations are more important if wages are negotiated between unions and firms rather than being determined in an atomistic labor market. By contrast, the relationship between job experience and wages is strictly positive and the coefficients are more or less of equal size in both sectors. Even controlling for other wage-determining characteristics, women and indigenous earn significantly less than men and non-indigenous, respectively. The gender wage gap and the racial wage gap seem to be particularly pronounced in the informal sector. There is a robust relationship between working time and wages. An increase in monthly working hours by 1% increases the monthly labor income on average by 0.37% in the formal sector, and 0.41% in the informal sector.

The return to being in independent employment is consistently positive and statistically significant (except for 2001) in the formal sector, but much smaller (or even negative in 1999) and much more volatile in the informal sector. However, we caution not to read too much into this dummy. The main reason for including it into the sector-specific earnings functions is to correct for a potential over-reporting bias since earnings of self-employed, independent professionals and employers may not always be measured net of costs. Finally, we find that wages adjust to differences in the local price levels.

27 Our results differ from Moenstad (2000) in that (a) her analysis extends only to 1995 and (b) her returns to schooling are highly volatile and negative for up to higher secondary education (12 years of schooling). We attribute her surprising results on the returns to schooling to a misspecification of her sector-specific earnings functions.

Table 4: Formal Employment Share and Results of Oaxaca-Ransom Decomposition

	1989	1991	1993	1995	1997	1999	2001
Formal Employment Share (weighted in %)	42.57	54.29	57.00	55.91	54.80	52.69	50.12
Mean Log Wage Difference	0.352	0.502	0.731	0.622	0.579	0.726	0.806
- Log Endowment Component	0.194	0.330	0.488	0.363	0.344	0.572	0.615
= Log Rent Component	0.158	0.172	0.243	0.259	0.235	0.154	0.191

Source: own calculations based on EIH 1989, 1991, 1993, 1995, ENE 1997, and ECH 1999, 2001

Table 4 reports the estimates on the formal employment shares and the results of the Oaxaca-Ransom decomposition of the wage gap between the formal and the informal sector. The formal employment share follows a hump-shaped time path, rising from 42.6% in 1989 to 57.0% in 1993 and falling thereafter to 50.1% in 2001 [28]. The empirically observed mean log wage difference rises sharply from 1989 to 1993, and after a transitional phase of decline, it rises further to its highest value in 2001. However, correcting for differences in the mean endowment with wage-determining characteristics between formal and informal workers, the empirical picture changes. The log rent component of the formal wage follows a hump-shaped time path between 1989 and 1999 with the peak being in 1995. From 1999 to 2001, it increases again.

Referring to Section 3.7, we can finally link our theoretical and empirical results, and check whether our small-scale macroeconomic model helps explain the impact of structural reforms on the distribution of wages and employment between the formal and informal sector. As predicted, we find an expansion of formal employment in the early years of the structural reform process, and a reversal of this trend later on. The expansion was particularly strong between 1989 and 1991, which we attribute to that the effects of product-market deregulation and of the liberalization of the trade regime reinforced each other at this point of time. Our estimates on the rent component of the formal wage are more difficult to reconcile with the implications of the theoretical model. However, it is probably safe to conclude that the impact of opening up to international trade on the demand for goods in the formal sector was the dominant driving force. With a short time

28 Again, our results differ significantly from Moersted (2000), which can be attributed to her using a simpler sector classification. Her estimates on the formal employment share rise from 45.5% in 1989 to 77.8% in 1995. However, we put more faith in our sector classification since it allows us to closely track the official figures on the formal employment share. Compare UDAPE (var ss).

lag, the improvement of the trade balance more or less coincided with the rise, and its deterioration with a fall in the rent component of the formal wage. Product-market deregulation seems to have only been able to temporarily offset or delay the rise in the rent component of the formal wage in the late 1980s and early 1990s.

Table 3: Regression Results on the Determonants of Formal and Informal Wages

	1989		1991		1993		1995		1997		1999		2001	
	Formal	Informal	Formal	Informal	Formal	Informal	Formal	Informal	Formal	Informal	Formal	Informal	Formal	Informal
AGE														
25 - 34 years	0.063	0.097*	0.099**	0.118**	0.121**	0.100**	0.144**	-0.01	0.127*	0.048	0.133	0.145	0.12	0.074
35 - 44 years	0.202**	0.253**	0.233**	0.130**	0.251**	0.144**	0.386**	0.099**	0.277**	0.157**	0.292**	0.154	0.365**	0.223**
45 - 54 years	0.238**	0.199**	0.282**	0.188**	0.367**	0.069	0.432**	0.148**	0.375**	0.103	0.287**	0.055	0.321**	0.067
56 - 65 years	0.2567**	0.249**	0.232**	0.05	0.258**	-0.134**	0.335**	-0.052	0.299**	-0.048	0.163	0.19	0.339**	0.057
EDUCATION														
basic complete lower second	0.127	0.072	0.144*	0.151**	0.188**	0.173**	0.120*	0.186**	0.209**	0.163*	0.173	0.237	0.074	0.212
incomplete	0.157	0.255**	0.151**	0.219**	0.215**	0.213**	0.233**	0.162**	0.225*	0.172*	0.159	0.286*	0.082	0.245*
lower second complete	0.212*	0.216**	0.267**	0.392**	0.386**	0.214**	0.134*	0.235**	0.342**	0.233**	0.404**	0522**	0.282*	0.218
higher second incomplete	0.394**	0.369**	0.258**	0.280**	0.330**	0.247**	0.221**	0.166**	0.341**	0.111	0.227	0.294**	0.162	0.331**
higher second complete	0.438**	0.369**	0.412**	0.374**	0.420**	0.345**	0.434**	0.292**	0.479**	0.323**	0.454**	0.422**	0.325**	0.307**
teachers college	0.280**	0.369**	0.360**	0.541**	0.514**	0.408*	0.475**	0.395*	0.602**	0.39	0.527**	0.598	0.626**	0.087
other tertiary	0.877**	0.526**	0.751**	0.267**	0.850**	0.446**	0.795**	0.330**	0.826**	0.277**	0.611**	0.855**	0.618**	0.729**
university	0.925**	0.641**	0.910**	0.637**	1.081**	0.501**	1.041**	0.458**	1.158**	0.440**	0.998**	0.646**	1.028**	0.851**
JOB ESPERIENCE														
1 - 3 years	0.113	0.117*	0.032	0.013	0.141**	0.122*	n.a.	n.a.	-0.015	0.143*	0.113	0.168	0.066	-0.054
3 - 10 years	0.236**	0.168**	0.156**	0.122**	0.202**	0.260**	n.a.	n.a.	0.153**	0.211**	0.206*	0.446**	0.174*	0.138
> = years	0.351**	0.219**	0.242**	0.180**	0.341**	0.324**	n.a.	n.a.	0.202**	0.229**	0.320**	0.452**	0.255**	0.194
female	-0.254**	-0.429**	-0.261**	-0.511**	-0.224**	-0.648**	-0.199**	-0.501**	-0.228**	-0.484**	-0.246**	-0.574**	-0.280**	-0.384**
indigenouus	0.091*	-0.152**	n.a.	n.a.	-0.118**	0.245**	n.a.	n.a.	-0.078	-0.179**	0.018	-0.098	-0.147*	-0.047
log working hours	0.369**	0.359**	0.328**	0.330**	0.393**	0.319**	0.352**	0.439**	0.369**	0.435**	0.357**	0.462**	0.420**	0.545**
indep employment	0.678**	0.290**	0.467**	0.307**	0.538**	0.163**	0.524**	0.411**	0.513**	0.409**	0.457**	-0.046	0.149	0.119*
local price level	1.855**	2.243*	1.882**	2.590**	1.528**	2.704**	1.716**	1.949**	1.643**	0.735**	1.807**	2.666**	1.292**	0.802*
No. of clusters	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	264	259	164	162	211	210
No. of obs (unweight)	2945	3783	429	3593	3195	2545	4378	3414	2439	1946	975	814	1113	11
Requared	0.356	0.277	0.321	0.328	0.398	0.411	0.359	0.312	0.37	0.298	0.357	0.383	0.347	0.318

Source: own calculations based on EIH 1989, 1991, 1993, 1995, ENE 1997, and ECH 1999, 2001

Notes: Equations (20) and (21) also include a constant term, its coefficient is not reported here

** denotes coefficient significant at 5% and*

*** at 1%. Standard errors are corrected for heteroskedasticity using the covariance matrix estimator proposed by White (1980).*

Since primary sampling units are not available for the EIHs, standard errors are corrected for clustering from 1997 onwards only.

5. Summary and Conclusions

This paper seeks to contribute to the ongoing controversy on the distributional effects of structural reforms in developing countries. To this end, we set up a small-scale macroeconomic model of a dual economy to capture the transmission mechanisms through which the deregulation of product and factor markets, the liberalization of the trade and FDI regime, and the privatization of public companies impact on the distribution of employment and wages between the formal and the informal sector. We find that the distributional effects of structural reforms are almost always context dependent, belying any oversimplified statements for or against structural reforms made in the opposing camps. Only in the case of deregulation – be it of product markets or labor markets – is the outcome clear-cut in that it causes an expansion of the formal employment share and a reduction in the rent component of the formal wage. However, the distributional effects of the liberalization of the trade and FDI regime and of the privatization of public companies are a priori undetermined and depend on the strength of the different transmission mechanisms.

To shed further light into this issue and to test our theoretical model empirically, we carry out a detailed case study on Bolivia. By giving an overview of the structural reforms undertaken in Bolivia since 1985, we show that Bolivia has been a "star reformer" by Latin American standards. However, the structural reform progress did not occur uniformly in all policy areas. Bolivia implemented the deregulation of product markets and the liberalization of the trade and FDI regime earlier than most Latin American countries, while it lagged substantially behind with respect to the privatization of public companies. A comprehensive and far-reaching labor market reform is still pending.

Feeding the Bolivian structural reform process into our small-scale macroeconomic model, we offer a consistent explanation for the empirically observed trends in the distribution of employment and wages between the formal and the informal sector. Estimating the employment share and isolating the rent component of the formal wage using the methodology proposed by Oaxaca and Ransom (1994), we find that both variables more or less follow a hump-shaped time path. This result suggests that the trade-balance effect of liberalizing the trade regime was the dominant driving force behind the post-reform wage and employment trends. However, while the rise in formal

employment is particularly strong between 1989 and 1991, the rise in the rent component of the formal wage seems to have been temporarily offset or delayed at this point of time. We attribute this to the distributional effects of product-market deregulation. To promote formal employment without increasing the wage gap between the formal and the informal sector in the future, Bolivia would be well advised to comprehensively deregulate its labor markets.

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Selling their Best for Little: The Riddle of Ecuador's Failed Attempt to Assist Communal Farmers

María José Castillo and Richard Bellock

Summary

In the 1980s, Ecuador began an expensive project providing primary irrigation canals to the Santa Elena Peninsula. The intended beneficiaries were the region's communal farmers. Instead, virtually all irrigable lands have been sold to large farmers and land speculators, usually at exceedingly low prices. While political and economic abuses explain some of these sales, introduction into a communal setting of an innovation which improved returns to capital relative to labor made land divestitures almost inevitable. With effectively no access to credit, communal farmers had little ability to invest in secondary irrigation systems. Moreover, because users of irrigable lands did not fully control communal sales decisions, as these lands became attractive to others, dispossession risks rose. The net result was that reservation prices for holding these lands fell among communal farmers at the same time of increased demands for these assets by those outside the comunas. Implications for development strategies are also discussed.

1. Introduction

West of Guayaquil, Ecuador is the Santa Elena Peninsula (PSE), an area of 6,050 km² (see Figure 1). Until the middle of the 20th Century, PSE was a breadbasket, supplying vegetables, animal products, and timber. Due to excessive resource exploitation and climatic changes, the PSE was transformed into an almost treeless, semi-arid landscape. Many migrated from the land to urban areas, primarily Guayaquil (Alvarez, 1999). From

a population over a million, only 256,000[1] people remain on the Peninsula, with the large majority deriving livelihoods from the tourism (beaches) and the shrimp industry. Until very recently, virtually all agricultural land was organized into communal land holdings, known as comunas. With almost no exceptions, the approximately 70,000[2] comuneros in the PSE live in poverty. Per capita consumption by comuneros is $401,[3] less than a fourth of that for the country as a whole and barely above the $1.00 per day international standard commonly employed as the dividing line between poverty and abject poverty.

With the expressed goals of assisting the comuneros and reviving the productivity of the PSE, in the 1980s the Government of Ecuador began a US$580[4] million irrigation project.[5] Water would be pumped from two pumping stations (one in the Daule River and the other in the Chongón Reservoir) into a 120 kilometer system of primary canals and five reservoirs. It was estimated that, with construction by landowners of secondary systems, 50,000 hectares could be irrigated[6]. The large majority of the canals (around 100 km) were completed and filled with water as much as a decade ago and the last portions of the system (two more reservoirs and 2 canals) are still being completed. With the works finished so far (see Figure 1), between 20,000 and 30,000 hectares could be irrigated, however only 6,000 hectares are currently under irrigation from the canals[7]. At least as troubling, virtually all of this production is by large growers who acquired their lands from the comunas. Indeed, the comunas have sold approximately 91% percent of potentially irrigable lands to such growers and land speculators.[8] According to available anecdotal information, these sales were at prices well below the most conservative estimates of the present value of potential production. The majority

1 Estimation of Escuela Superior Politécnica del Litoral, 2000. See Sectores poblados y mano de obra/Componente 1 in Escuela Superior Politécnica del Litoral.

2 Ibid.

3 Comunero consumption estimate from Castillo, 2003b. Ecuadorian consumption average from World Bank.

4 See Infraestructura de Riego/Infraestructura/Componente 1 in Escuela Superior Politécnica del Litoral.

5 Another goal of the project was to supply water for residential and industrial purposes.

6 See Infraestructura de Riego/Infraestructura/Componente 1 in Escuela Superior Politécnica del Litoral.

7 Ibid.

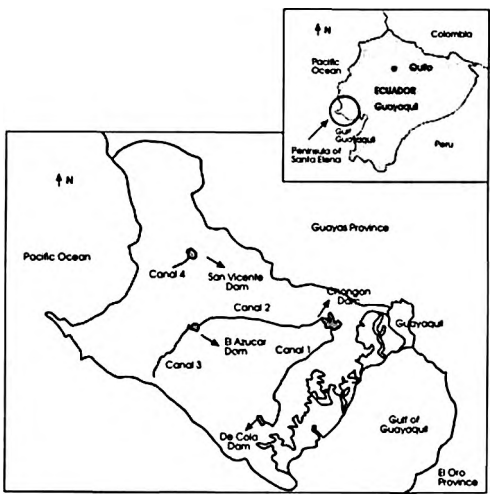
8 Interview with Jaime Proaño from CEDEGE, 2000. Also Castillo (2003b), studying four comunas where the canals had been built, found that virtually all irrigable lands had been sold, accounting for nearly two thirds of all lands formerly held by these Comunas.

of the prices for irrigable lands were between US$40 and $400 per hectare (Castillo, 2003b). In other words, the comunas sold their best lands at bargain basement prices.

The goal of the analysis presented in this paper was to investigate what happened. Did the economically powerful use political influence and even armed force to wrest lands from the comuneros? Did comuneros sell their lands due to poor information about market opportunities for the products the canals made possible to produce and, by extension, the fair market value of their lands? Were the comuneros motivated by poverty or hedonism to surrender longer term gains in favor of small, but immediate compensation? Was there corruption? In some instances and to some degree, no doubt all of this happened. But we will argue that the main cause was that the combination of the type of investment made by the Ecuadorian Government and the communal structure of the land holdings increased the valuation (i.e., the reservation price) of the land for those outside the comunas while, at the same time, lowering those valuations for the comuneros. The resulting gap in valuations was greater the more suitable the lands for irrigation. It was this effect, primarily, which led the comuneros to the economically rational, though seemingly perverse, decisions to liquidate their best lands, even at low prices.

Beyond explaining past events, these findings have relevance for the northwestern part of the PSE, where the final phase irrigation project is under construction and, more generally, for development projects worldwide where the intended beneficiaries hold resources communally.

Figure 1: Peninsula of Santa Elena and Works of the Hydraulic Project Santa Elena Aqueduct completed so far



2. The Analysis

2.1 Overview of Feder and Feeny Model

The point of departure for our analysis is a simple, but rich and flexible model developed by Gershon Feder and David Feeny to explain investment, production, and land acquisition/retention decisions by peasants. Their model depicts a rural economy where there are private land holdings, but land rights are subject to risk. A farmer is assumed to maximize expected utility which is separable in two arguments: current consumption and the next period's wealth. The maximization process involves allocating his/her initial endowment and borrowed funds among three uses: current consumption, land acquisition, and investment in physical capital.

Some of the basic components and assumptions of the model follow:

- There is a two-period planning horizon. Both periods are of indeterminate length.
- Land acquisition/retention,[9] consumption, and investment decisions made in the first period determine production in the second period.
- Capital is completely used up in the process of production, i.e., by the end of Period 2. While we will not deviate from this assumption, its restrictive nature should be recognized. In particular, the requirement that capital be exhausted denies the possibility of applying capital, in part, to increase the value of the land in anticipation of future sales.
- The utility function is linear in terminal wealth.
- Risk to property rights is represented by a non-zero probability ϕ that the current farmer will lose both the Period 2 output and the land.
- The possibility of obtaining land through actions different from purchases is viewed as an exogenous probabilistic event.

Notation of the model:

T = quantity demanded of land

P = price of land

k = capital-land ratio

Note: Capital is a numeraire variable. That is, Capital is $1 per unit. As such, k becomes the number of dollars of Capital used per unit of land.

C_0 = first period consumption

W_0 = initial wealth

ϕ = probability of ownership and output loss in the second period.

U, U_0 = total utility and Period 1 utility, respectively.

y = monetary value of output per unit of land

r = interest rate.

9 In their discussion, Feder and Feeny begin period 1 with the farmer having no land and an initial amount of wealth, W_0. However, by a trivial extension of the model, a portion of W_0 can be specified as being land.

In Period 1, land and capital are obtained (and/or retained) to produce the next period's output. The production function exhibits constant returns to scale in land and capital. The per hectare output is described in Equation 1.

(1) $y = y(k);\ y'(k) > 0;\ y''(k) < 0$

The utility of current consumption is a concave function with decreasing marginal utility, see equation 2.

(2) $Uo = Uo\,(C);\ Uo'(C) > 0;\ Uo''(Co) < 0$

The amount of credit, S, available to a farmer is limited by the value of his/her land holdings (the only acceptable collateral) and by the degree of risk of losing the land, see equation 3.

(3) $S = s\,(\phi)\,PT,$

The proportion of land value lending institutions are willing to give as loans is s, $0 \leq s \leq 1$. As would be expected, s is a function of the risk of land loss with $s' < 0$.

The farmer selects C_o, T, and k so as to maximize total utility, see equation 4.

(4) $\underset{C_o,T,k}{Max}\ U = U_o(C_o) + [1-\phi]T[y(k)+P] - [1+r]s(\phi)PT$

$\{U_o(C_o)\}$ is the utility of current consumption and $\{[1-\phi]T[y(k)+P] - [1+r]s(\phi)PT\}$ is the expected terminal wealth, that is, output plus land value times the probability that they will still be possessed at the end of period 2, minus debt repayment[10]. This maximization is subject to a budget constraint whereby expenditures for land acquisition, capital investment, and current consumption cannot exceed initial wealth plus borrowed funds, see equation 5.

(5) $W_o + s(\phi)PT = kT + PT + C_o$

10 As an aside, this formulation suggests risk neutrality, that is unless the f assumed by a farmer is biased upwards (risk averseness) or downward (risk loving).

Solving for Co in equation 5 (i.e., $Co = Wo + s(\phi)PT - kT - PT$) and substituting into the right-hand side of equation 4, the resulting maximization equation is presented in equation 6:

(6) $$\underset{T,k}{Max}\, U = U(W_o - PT[1-s] - kT) + [1-\phi]T[\gamma(k) + P] - [1+r]s(\phi)PT$$

The solution of the first and second order conditions to solve for the optimum values of T and k is presented in the Appendix. Three important, though unsurprising, results which will be used in the following discussion are that heightened risk of dispossession (ϕ) reduces

The quantity demanded of land, i.e., $\frac{dT}{d\phi} < 0$;

Per hectare capital usage, i.e., $\frac{dk}{d\phi} < 0$; and

The equilibrium price of land, i.e., $\frac{dP}{d\phi} < 0$

Again, these results apply to an economy where credit is available to everybody using (and owning) land, and credit is related to land value and to security of land rights. We will now present modifications to the theoretical model to capture better conditions on PSE.

For a brief discussion of the implications of the model's simplifying assumptions, see Appendix 2.

2.2 Modifying the Model to Conditions on the Peninsula of Santa Elena

Feder and Feeny modeled a situation in which there were essentially homogeneous agriculturalists determining the amounts of land, capital, and credit they would obtain, all subject to similar levels of risk and operating under similar incentive systems. The situation on PSE was, and remains, quite different. There are two distinct types of land users: the comuneros and the commercial farmers/land speculators or, more generally, non-comuneros.

Comuneros: Traditionally and by Ecuadorian law, virtually all rural land in PSE is held communally. Due to resource degradation and climatic changes resulting in near-desertification of much of the land, as well as the lure of job opportunities in urban areas, many comuneros migrated. For the remaining comuneros, while the land was not very productive, at least it was not in short supply. Indeed, there were areas in many comunas that were either entirely unused or only used sporadically and/or at very low levels of intensity. With effectively a zero shadow price on lands, individual comuneros were virtually assured of secure usage rights on plots previously allocated to them by the comuna.

Credit Market: Because comuneros had usage, but not individual ownership rights, 'their' land could not be employed as collateral.[11] As such, Comuneros had effectively no access to credit.[12] In terms of the Feder and Feeny model, $s = 0$ and hence also $S = 0$.

Land Market: Individual comuneros are not permitted to sell communal lands. This, combined with no access to credit markets, effectively precludes individual comuneros from the land markets. However, acting as a community, usage rights can be altered and comuna lands may be sold to other parties or additional lands purchased.[13] Unlike the farmers envisioned by Feder and Feeny, the amount of land, T, is not a decision variable nor is land part of a comunero's wealth, W_o, i.e., for the individual comunero $TP = 0$. As such, the comunero is reduced to one decision variable, k, because he/she has control over land use, but not over decisions to retain or sell the land. Therefore, the comunero faces a maximization problem as follows:

$$(7) \qquad MaxU = U\circ(W\circ - kT) + [1-\phi]T\,y(k)\,;\; with\; \frac{dk}{d\phi} < 0$$

Direct impact of the canals: The primary constraint to increased agricultural productivity on the PSE is the low and irregular availability of water (Alvarez, 1999). The canals were intended to alleviate this problem. However, to utilize this water effectively

11 In addition, as long as the productive potential of the lands was low, their value as collateral would, likewise, have been low or even nil.

12 Through informal channels and some NGOs, comuneros actually have access to credit, but loan amounts are typically very small, see Castillo (2003a). Moreover, the Government did not provide special credit programs to facilitate exploitation of the canals by comuneros.

13 In practice, prior to building the canals, comunas almost never bought or sold land.

requires investment in secondary irrigation systems (i.e., pumps, pipes and/or secondary canals, sprinklers, drip irrigation systems, etc.) In terms of the model, the canals increased $y'(k)$, the marginal impact of capital on yields (i.e., the slope of the yields curve), but this increase only applied beyond threshold levels necessary to provide the means for bringing water from the canals to the fields (see Figure 2). With no significant attachable assets, reaching these thresholds was beyond the means of the comuneros and, as such, the canals were of minimal value, at best, for agricultural production

Non-comuneros: Non-comuneros include those interested in entering the PSE land market either to engage in agricultural production or for speculation Relative to comuneros, these are individuals with considerable financial means and political influence Ironically, the Feder and Feeny model presented above, which was intended to describe peasants, can be employed without modification for this group

Credit Market: This group clearly has access to credit markets both because, in general, these individuals already owned attachable assets not on PSE and could also use lands purchased on PSE for collateral.[14] To the extent lands can be used for collateral, non-comuneros would derive a collateral premium[15]

Land Markets: Due to tradition and vagaries in Ecuadorian law, there has been some question regarding the legality of individuals purchasing communal lands, even with community approval. Despite of this, since initiation of the irrigation project sales have become common.[16] As such, non-comuneros have effective access to land markets in PSE

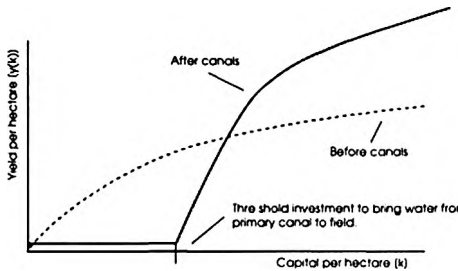
Direct impacts of the canals: Unlike the comuneros, the non-comuneros had access to the sufficient capital to use the canals to increase agricultural yields

14 It should be noted that this group bears a non-zero, though probably small, risk of dispossession (ϕ) from potential challenges to the legality of some of the purchases of communal lands

15 Feder and Feeny define collateral premium as "the result of the owner's ability to obtain additional and cheaper credit by pledging the land as collateral."

16 If and the extent to which this resulted from appropriate and inappropriate uses of political and economic influence remains and open question

Figure 2: The Impact of Capital on Yields before and after Building of Primary Irrigation Canals



2.3 Explaining the Sales of Irrigable Lands

As described in the introduction, the building of the canals did not bring an agricultural and economic renaissance to the comunas, but rather the sale of almost all potentially irrigable lands to non-comuneros. These events may be readily explained employing the Feder and Feeny model, with the just-described modifications for the comuneros. A schematic of the following discussion is presented in Figure 3.

Prior to the development of the canals, non-comuneros had little interest in land held by the comunas, due to its low productivity. Moreover, as there was a large supply relative to the population, individual comuneros had secure usage rights. The primary canals increased the productive potential of the land if and only if sufficient, i.e., threshold level of, capital was applied to facilitate delivery of water from the canals to the fields (see Figure 2). As the land was held communally, regardless of the productive potential of the lands they used, comuneros could not secure sufficient credit to acquire threshold levels of capital needed to exploit the canals. But non-comuneros could. Therefore, due to the enhanced productive potential of the land, the canals precipitated an outward shift of the demand for land, with all of that increase being from the non-comuneros.

Because of the communal nature of the land tenure, non-comuneros had to negotiate with comunas, as a whole, for land parcels, rather than with the individual

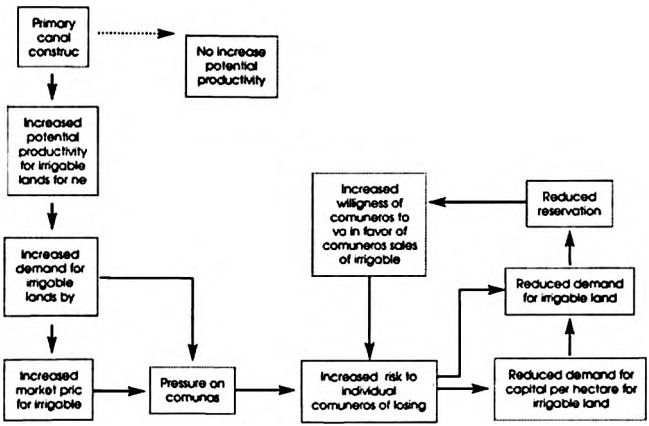
comuneros who had usage rights to the land. If proper procedures were followed, decisions to sell were based on community-wide voting or objective deliberations by legitimate representatives of the community. If there was corruption, as has been alleged in some cases, individuals holding authority in a community might have approved sales for personal gain, rather than purely from considerations of public welfare. Either way, individual comuneros holding rights over irrigable lands did not fully control the process. As such, these individuals were at risk of dispossession, a risk that effectively did not exist before the canals were built.

Due to this increased risk of dispossession, incentives to make capital investments over the land were further diminished, i.e., $(dk/d\phi)<0$. Comunero demands for these lands would have fallen due to the combination of 1. heightened risk of dispossession, i.e., $(dT/d\phi)<0$,[17] 2. reduced incentives to make land investments, and 3. that property values are not part of the wealth of individual comuneros using the lands, i.e., $TP = 0$.

With the coming of the canals, the demand for irrigable lands rose for non-comuneros. As the supply of these lands was fixed, the maximum prices they were willing to pay for their purchase rose. At the same time and as a result of this rise in demand on the part of non-comuneros (which increased dispossession risk) demands fell for comuneros, i.e., the minimums they were willing to accept as compensation for losing use of the lands fell. Reservation price gaps developed, with potential buyers willing to pay more than the minimum acceptable to potential sellers. These reservation price gaps would have been wider (and incentives for sales greater) the more suitable the lands for irrigation and the greater the resulting yield enhancements. The expected result of this process is consistent with what actually occurred, systematic selling by comunas of the lands having the greatest potentials through exploitation of the canals.

17 This change in T due to a higher risk (ϕ) applies to the community as a whole as T is not a decision variable for the individual comunero.

Figure 3: Schematic of Impacts of Canals on Comunero and Non-comunero Demands for Lands Potentially Irrigable from Primary Canals



2.4 Comment on Low Sale Prices

Reservation price gaps between non-comuneros and comuneros explain the land sales, but not sale prices as low as $40 00 per hectare for irrigable lands (see Castillo, 2003b) Why haven't the comuneros been better negotiators? It seems likely that the communal structure of the landownership contributed to this outcome As the voluminous transactions cost literature attests, negotiating is not free Any individual comunero devoting resources to negotiate a better price would have shared the fruits of that activity with all comuneros,[18] the classic positive externality/free rider problem Moreover, in most cases only a portion of comuna land was potentially irrigable Comuneros with usage rights on non-irrigable portions had little or nothing to lose from sales of irrigable lands and, indeed, could only benefit from those lands if there were sales For these individuals, reservation prices may have been exceedingly low

18 As that negotiator would have received his/her share of sales revenue

That the communal structure may have contributed to very poor realized sales terms is only the icing on this dismal cake. The sales were due to the reservation price gaps. The reservation price gaps were due primarily to the enhancement of returns from capital brought about by the canals and comunero credit constraints [as land and any improvements could not be attached] and secondarily to dispossession risk to the users of those lands[19]. As long as these conditions existed, the sales were probably inevitable.

3. Implications for Development Policy

The analysis of PSE has highlighted three aspects of communal asset ownership systems, that:

- Users of communal assets cannot consider the market value to be part of their own wealth.
- Users of communal assets normally face severe credit constraints as they are unable to employ the assets they use as collateral. As a result, feasible levels of capital improvements tend to be low.
- Sales of portions of communal assets are decided by the entire community, through either direct vote or representatives, and not solely by those individuals using those portions of the assets. As such, when purchase offers are made to the community, individual users are at risk of involuntary dispossession.

In PSE these factors led to near-complete divestiture by the comunas of lands potentially irrigable from the primary canals. The canals enhanced returns from [above threshold] applications of capital on irrigable lands. Because of the canals, those able to acquire capital, i.e., non-comuneros, had an advantage in the use of those lands relative to comuneros. Given this, sales of irrigable lands to non-comuneros were rational.

There are two main implications of this work for development policy. The first is consistent with the broad consensus views of development literature and practitioners,

19 Cortez and Salgado (2001) also suggest this result when asserting that "capital-constrained" individuals have a smaller shadow price of the land than unconstrained individuals, which makes their demand for land lower. When high risk of losing land is added, they conclude, "the competitiveness dampening effects of credit constraints are likely to be enhanced" (p256), further reducing demands for land.

that private ownership is usually superior to communal systems. In the case of PSE, we do not assert that had the land been privately owned there would not have been sales to outsiders. Rather, if the lands had been privately owned, an owner would have had:

- Greater scope for exploiting the canals, as he/she could have used the land for collateral.
- More incentives to invest in the land due to lower dispossession risk and the ability to capture the value of improvements (through earnings stream enhancements or higher land values).
- Stronger negotiating positions, as well as greater incentives to secure the best terms, if they elected to sell the land.

As a general rule, communal asset holders should be encouraged to privatize or, at least, develop institutions that facilitate improved management along the lines of cooperative or corporate structures.

The second implication is that when assets are communally held, development programs that can be best exploited by clients through applications of capital may trigger divestiture of those assets. This suggests that a bias in favor of labor-intensive development may be particularly appropriate when there are communal holdings. Alternatively, safeguards may be necessary when interventions favor the use of capital. These may include oversight of asset transfers and/or lending programs to facilitate credit access.

APPENDIX 1:

OPTIMIZATION SOLUTION FOR THE FEDER AND FEENY MODEL

The solution for determining optimum values of k and T, as well as the impacts of changes in selected parameters are presented in this Appendix. Equation 6, from the text, is repeated below.

$$(6) \quad \underset{T,k}{Max} U = U(W_o - PT[1-s] - kT) + [1-\phi]T[y(k) + P] - [1+r]s(\phi)PT$$

At the optimal values of T and k, the first-order derivatives have to equal zero. The expression above is hereafter referred to as F. For the first order conditions, see equations 1a and 2a:

(1a) $$\frac{\partial F}{\partial T} = [1-\phi][y+P] - U'\{P[1-s]+k\} - [1+r]s(\phi)P = 0$$

(2a) $$\frac{\partial F}{\partial T} = [1-\phi]Ty' - TU' = 0$$

To verify that the choice of T and k maximizes the utility function, the first element (first row, first column) of the Hessian needs to be negative and the determinant of the matrix positive (see equation 3a).

(3a) $$[H] = \begin{bmatrix} U''\{P[1-s]+k\}^2 & U''\{P[1-s]+k\}T \\ U''\{P[1-s]+k\}T & T[1-\phi]y'' + T^2U'' \end{bmatrix}$$

The first element is: $U''\{P[1-s]+k\}^2 < 0$.

The determinant is: $\Delta = T[1-\phi]U''\{P[1-s]+k\}^2 y'' > 0$

Once the second-order conditions are satisfied, the model can be used to analyze how the optimal choice functions react to changes in the parameter P. Differentiating the first-order conditions with respect to P and arranging the terms into matrix form, yields equation 4a:

(4a) $$[H]\begin{pmatrix} \frac{dT}{dP} \\ \\ \frac{dk}{dP} \end{pmatrix} = \begin{pmatrix} [1-\phi][y-y'k]/P - U''\{[1-s]P+k\}[1-s]T \\ \\ -T^2U''[1-s] \end{pmatrix}$$

Using Cramer's rule yields equations 5a and 6a:

(5a)

$$\frac{dT}{dP} = \frac{1}{\Delta}\left\{[1-\phi][[y-ky]/P]\left[T[1-\phi]y'' + T^2U''\right] - U''\left[[1-s]P+k\right]T^2[1-s][1-\phi]y''\right\} < 0$$

and (6a)

$$\frac{dk}{dP} = \frac{1}{\Delta}\left\{-[1-\phi]\ \{[y-y'k]/P]\}\right\} U''\left\{[1-s]P+k\right\}T < 0$$

Equation 5a indicates that the quantity demanded of T is negatively related to price, i e , a downward sloping demand curve for land Equation 6a demonstrates that the capital-land ratio, k, is positively related to the price of land as farmers substitute capital for land

The model can also be employed to show that the optimal choice of T is negatively affected by an increase in the risk to ownership if land prices are held fixed, see equations 7a and 8a

(7a)
$$[H]\begin{pmatrix} \frac{dT}{d\phi} \\ \\ \frac{dk}{d\phi} \end{pmatrix} = \begin{pmatrix} y + P - \left\{[1-\phi]y' - [1+r]\right\}Ps' + TU''\left\{[1-s]P+k\right\}Ps \\ \\ T' + T'U''\,Ps' \end{pmatrix}$$

(8a)

$$\frac{dT}{dP} = \frac{1}{\Delta}\left\{+P - \left\{[1-\phi]y' - [1+r]\right\}Ps' + TU''\left\{[1-s]P+k\right\}Ps'\right\}T[1-\phi]\,y'' < 0$$
$$+T^2[1+r]s\,PU''/[1-\phi] - T^2U''\left[[1-\phi]y' - [1+r]\right]Ps' < 0$$

The expression $\{[1-\phi]\, y' - [1+r]\}$ is greater than zero because the credit constraint is assumed to be binding. This means that the expected[20] marginal productivity of the land has to be greater than the cost of capital for the individual to be willing to ask for credit.

Because the demand for land is downward sloping, and given that the supply of land is fixed[21], there is an equilibrium price for land that depends on ϕ, the probability of losing land. In other words, if the demand for land is reduced after an increase in ϕ, the equilibrium price of land declines, see equation 9a.

$$(9a) \quad \frac{dP}{d\phi} = -\left[\frac{dT/d\phi}{dT/dP}\right] < 0$$

Through its negative effect on the price of land, the capital-land ratio, k, also is negatively affected by an increase in the risk to ownership, see equation 10a.

$$(10a) \quad \frac{dk}{d\phi} = \frac{dk}{d\phi} + \frac{dk}{dP}\frac{dP}{d\phi} = \frac{dk}{d\phi} - \frac{dk}{dP}\left[\frac{dT/d\phi}{dT/dP}\right]$$
$$= \left\{Ty'[1-\phi][y-y'k]/P + T^2U''[1-s]\left\{Py'[1-s] + y'k - y - P\right\}\right.$$
$$\left. + TU''[r+\phi]s'\right\}/[dT/dP]\,\Delta < 0$$

APPENDIX 2:

COMMENTS ON SIMPLIFYING ASSUMPTIONS IN THE FEDER/FEENY MODEL

Delineating the crucial interrelationships for a study in a setting sufficiently simple to facilitate analysis and prediction is the essence of economic modeling or, indeed, virtually any scientific investigation. To yield fruitful results, the system of

20 By "expected" is meant both the usual meaning of uncertainty regarding actual productivity and/or market conditions and, in addition, accounting for uncertainties regarding risks of dispossession, i.e., ϕ.

21 The physical supply of land is always fixed. The economic supply of land could increase making available, through irrigation infrastructure for example, some currently unproductive land. In this model, it seems that economic supply of land is at the frontier of possibilities of production, that is, all the land has been transformed to be available for economic use.

interrelationships must be reasonable and, moreover, simplifications made should not compromise the model's real world applicability. In the Feder/Feeny model three simplifying assumptions are made, explicitly or implicitly. None of these jeopardized the validity of the model for our analysis.

Two periods: Two periods are envisioned: an initial period in which consumption occurs, as well as, acquisition decisions to facilitate production in the second and final period. Each period is of indeterminate length. Any real world process — economic, cultural, biological, etc. — might best be portrayed as an infinite series of stages or periods, with each successive stage incorporating and adjusting to events of the previous stage, perhaps a nanosecond before. Regardless of the discipline, modeling real world, infinite stage processes almost invariably involves abstraction to finite stage processes. From the standpoint of our study, a two period model, with the first for planning/preparation of activities in the second period was entirely appropriate. The focus of the work was explaining decisions to retain, sell, or buy land given land tenure regimes, credit constraints, and the presence of primary canals. Those decisions (made in the first period) would be based upon expected returns, dispossession risks, etc. in the second period.

Another potential criticism of a two period model is implication that there is nothing beyond the second period. This could easily be addressed by defining for potential production in the second period goods such as "land or capital for later use by the individual or his/her descendents."

No land in the initial period. Individuals begin with an endowment of wealth, Wo, they employ, along with borrowings, to obtain goods and services for current consumption and both land and capital to facilitate production in the next period. This simplification does not present a problem for two reasons. First, in our analysis we deal with two types of individuals, neither of which initially owns land, though one type has usage rights to land. Second, as the model was structured, landlessness was unnecessary. While Feder and Feeny portrayed individuals as initially being landless, the forms in which Wo was held were not specified. Second, there is no reason why part of Wo could not be land which could be sold for consumption goods or capital. If land is not sold, then, in effect, that initial period asset is being used to 'purchase' land for the second period.

All capital exhausted by the end of the second period: In the model, capital is exhausted by the end of the second period and, as such, does not add to terminal wealth, i.e., the sum of the values of production and land held at the end of the second period. Therefore as used by Feder and Feeny, capital may be thought of as working capital to secure supplies, such as seed and fertilizer, and light machinery which are consumed or worn out during the production process, and not including essentially permanent improvements, such as buildings, retaining walls, and heavy machinery. This is not critical to our use of the model. Moreover, even without altering the model, a more generalized concept of capital can be incorporated. The demand for capital is a derived demand. That is, capital is not acquired for its own sake, but for the production it can facilitate. The value of that additional production which is realized during the second period — tomatoes, livestock, grain, etc. — would appear as part of the terminal wealth. Similarly, at the end of the second period, potential future production from remaining capital could be considered to be a product and its present value added to terminal wealth.

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Fiscal Policy and Growth

*Alejandro F. Mercado**

The households have gone crazy, they have decided to give less food to their children, to restrict their essential expenses to a minimum, to buy less clothes and not to pay the school fees and tuition for their children, all of this with the sole objective of saving money. Some households save their money in the financial system, but most accumulate it in their houses, under their mattress. The madness also touches investors, their animal spirits have disappeared and they have reduced their investments, because, strangely, they no longer like to obtain earnings. The bankers, on the other hand, no longer lend money; they maintain the deposits of their clients in vaults and prefer to lose interest payments instead of lending money and increasing profits.

This strange behavior has generated a strong economic recession causing companies to close down and tossing workers on the street. This is the Keynesian explanation of a crisis. The cause is the irrational behavior of economic agents. In this context, the government should intervene to save the population that seems resolved to commit economic suicide. The government has to increase its expenditures to compensate for the fall in private spending. Where will the government obtain the money to save the economy? The government does not have any other alternative than to confiscate the resources that the private sector maintains sleeping; then, the government will build pyramids and make blood transfusions to the dead (e.g. business hospitals). This will reactivate the economy and prosperity will arrive to all households.

The previous explanation of a crisis and its possible solution is certainly attractive for an audience convinced that economic freedom is the cause of all our problems. Regrettably, my Keynesian colleagues have confused the cause and the effect of the recession. Paraphrasing Karl Marx, we could say that their economic analysis is

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inverted, up-side-down, we just need to turn it around, put it on its foot, and soon we will discover a rational seed under the mystic clothes.

The recession described above has its cause in the government's exaggerated expense that elevates the fiscal deficit to untenable levels. This phenomenon, accentuated by their mistaken intervention in the economy – more taxes – generates high uncertainty in all economic agents, because they do not know which other problems the government might cause. The households reduce their purchases, not because they want to reduce their consumption or want to save, but simply because they do not know if tomorrow they will maintain their employment and, in the face of an eventual possibility of being without revenues, they accumulate some extra money. Capitalists will not invest their resources because they do not know whether they will be able to recover their investments in the future or the government will confiscate their resources to cover the fiscal deficit. Bankers prefer not to lend the money they maintain of their vaults because they do not know if they will be able to recover it. In sum, the cause of the recession is the excessive intervention of the State in the economy and one of its first effects is the contraction of credit, the reduction of consumption expenses of the households and the disappearance of those "animal spirits" that make capitalists invest.

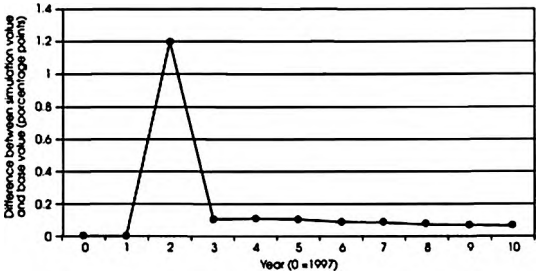
The results of an increase in public spending, to compensate the fall in the demand of the private sector, have been simulated through a Computable General Equilibrium Model of the Bolivian economy developed at IISEC. The model was developed using the structure of the Bolivian economy in 1997. To establish the baseline scenario for the next decade, various assumptions were imposed (See Mercado et al (2003) and Andersen & Evia (2003)). Using these assumptions and maintaining the structure and characteristics of the economy in 1997, the model predicts an average real rate of growth of 2.5 % per year during the 10 year forecast period.

The experiment consists of a one-time increase in public expenditure by an additional 10% in year 2 (on top of the 2.5% normal annual increase assumed in the base scenario), and subsequently returning to the historical rate of increase in public expenditures (2.5%) observed over the recent past. This corresponds to an additional outlay of approximately US$ 100 million every year in comparison with the data of the base scenario, and thus represents a permanent increase in the size of the government. It also brings about a permanent increase in the public deficit as a percentage of GDP.

of approximately 1.7 percent annually. The goal of this simulation is to determine whether growth can be permanently increased through an expansionary fiscal policy, given the composition and characteristics of the Bolivian economy.

Figure 1 shows that this permanent increase in the level of public spending generates only a temporary increase in the rate of growth of real GDP. In the year of the expansion, the rate of GDP growth is 1.2 percent higher than in the base scenario, but just one year later, the rate of growth returns to its natural level. As the level of public spending is much higher in the expansionary fiscal policy case than that of the base scenario and as the government carries a larger fiscal deficit, the conclusion is that expansionary fiscal policy in Bolivia is not effective in raising the rate of economic growth in the medium or long term.

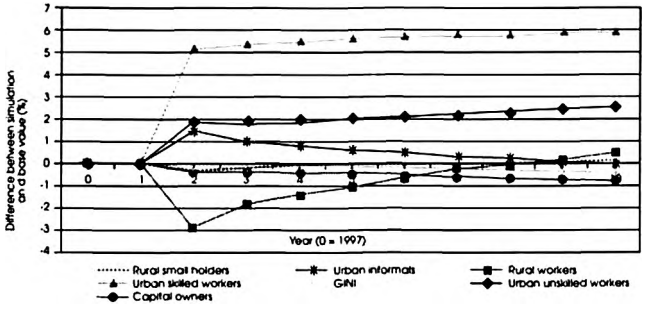
Figure 1: Real GDP Growth Rate



Source: IISEC's Computable General Equilibrium Model

The change in the composition of production that is generated by the increase in public spending also causes a modification in the distribution of household incomes. Figure 2 shows that skilled people in urban areas gain much more than the other groups. Those that lose most are rural workers and capitalists. As skilled workers are among the richest people in Bolivia already, this would tend to cause a deterioration in the income distribution. Capitalists are even richer, but since they comprise a relatively small group in Bolivia, its impact on the general income distribution is minor. The biggest and poorest group, the rural small-holders, are virtually unaffected by the dramatic increase in government spending. This means that more public spending would tend to widen the already huge gap in incomes between rural and urban households.

Figure 2



Source CGE simulation made by IISEC

In conclusion The permanent increase in public spending causes a very transitory increase in the rate of GDP growth of about 1.2 percentage points, but it comes accompanied by a permanent cost in terms of a bigger public deficit of 1 7% every year Higher public spending also tends mainly to favor the rich people

In the same line, Mercado (2002) estimated the determinants of Total Factor Productivity (TFP) for 1980-2002 and concluded that in all cases reductions in the participation of government expenditures to GDP are positively associated with his measures of TFP Other simulations of the effects of active monetary and fiscal policies, using IISEC's CGE model, can be reviewed in Mercado et al (2003) and Andersen & Evia (2003).

All the economic growth models, independently of their specificities, lead to the conclusion that economic growth will only be possible if investment expending increases, they also coincide in the fact that the financing of this investment must be sustained by domestic or foreign savings. Domestic savings are the sum of private savings and public savings, then, if the public sector presents a deficit, that is to say negative savings, this will necessarily reduce domestic savings, and most likely also foreign savings, translating into smaller global saving, less investment, and lower long run growth rates The belief or, better said, the myth, that increased public spending is expansive does not have a solid theoretical background and neither has it been supported by empirical data On the contrary, the empirical information proves it to be false

Amartya Sen: Utilitarianism, Ethics and Public Policy

Ramiro Ortega Landa

As the reader would agree, economics as a science, in teaching, research and policy, has a very poor record at ethics.

According to Ben Fine, Professor of Economics at the University of London, there are five inter-related reasons for this. First, the rigid distinction between positive-theoretical and normative-factual economics. Second, the very methodology of economics is unable to interrogate its own ethical foundations. Third, economics has neglected its own history as a discipline and in the process, its own changing ethical approaches and contents. Fourth, economics has isolated itself from other social sciences, so their contributions to ethical questions have been ignored, and fifth, mainstream economics has always been and is now intolerant with heterodox approaches.

In summary, with methodology, history of economic thought, interdisciplinarity and heterodoxy sidelined to marginal status, economics is lacking in the ethical meaning and implications of its standard concepts such as production, consumption, utility and *the market, let alone development itself.*

Until now, the issue of ethics and economics, especially in the context of public policy and development, has been dominated by Amartya Sen who has made fundamental contributions to at least four fields: social choice theory, welfare economics, economic measurement, and development economics. The pre-eminence that he has achieved in each of these different fields, is remarkable for any scholar.

This article briefly explores Sen's critiques to utilitarianism as source of capitalist ethics and some of his contributions that led Robert Solow, another Nobel laureate ecomist to call him the conscience of the profession

From the classic Sen of the seventies to his Nobel acceptance in 1999, social choice theory, has remained at the heart of his thinking. During this period, his work has raised and resolved two central issues. First, alternative interpersonal comparisons in terms of how much should one person's welfare count against another's, and second, the intensity of one individual's preferences and how much weight should be given to one individual's welfare in moving from one alternative to another of different utility

Sen and Utilitarianism

Utilitarianism, the basic thought by which we all should desire that people get what they want to the maximum degree possible, raises more questions than answers. In terms of political economy, utilitarianism holds that the best state of affairs is that in which the sum total of utility, is a maximum. Although this basic concept has been source of permanent debate, Sen believes that it is reasonable to proceed towards an effective doctrine to guide public policy by criticizing and transforming utilitarianism

In its simplest form, utilitarianism holds that what people want and how much they want it is given by how much they are willing to pay for it on the existing market. Consumption, that is access to goods or services, yields happiness or utility as an additive scalar quantity, therefore, the total purchases in the national market place yields a measure of how happy the population is, and consequently, in terms of public policy the aim of the government should be the maximization of the Gross Domestic Product GDP.

This conclusion is so simplistic that it barely needs criticism. As we all know, all non-market activity is outside the equation, anything contributing to happiness which is not bought on the market, is excluded from the calculation, distribution is ignored, irrationality of choice is excluded; nature is externalized, people are assumed to act rationally, in order to maximize their self-interest in the production and exchange of commodities; thus, people caring for others, doing public or community service, pursuing social, religious or aesthetic activities for their own sake, making gifts,

extending solidarity to others, are acting irrationally. All these criticisms of utilitarianism were well-known a long time ago and even Karl Marx ridiculed them in the 1860s.

One of the improvements of utilitarianism is called Choice Utilitarianism which gets rid of the principle of summing utility by basing the mathematics on either/or choices by economic agents, rather than being concerned with adding up values. This game-theoretic mathematics allows policy to direct towards the Pareto Optimum. The Pareto Optimum is a state of affairs in which there exists no potential exchange between two agents which could be mutually beneficial and it may be achieved in a perfectly competitive market environment. In other words, perfect laissez faire economics produces the situation in which everyone has the best they can get, and therefore, any form of regulation becomes a barrier to the free exchange between agents finding the Pareto Optimum.

Amartya Sen makes a number of specific criticisms on utilitarianism. The most significant of these is the criticism of utility as a measure of well-being. He points out that functioning is a more rational measure of well-being than opulence -command over a mass of commodities, or utility -the value of desired objects.

People can use things they command, whether purchased or enjoyed by nature, in order to achieve a level of functionality in life, but the level of functionality achieved depends on many factors other than just things used. Functionality, however, is a perfectly objective measurement: life expectancy, freedom from illness, level of education, freedom, etc.

Sudhir Anand, professor of economics at Oxford says "Amartya Sen has made major contributions not only in measuring poverty but understanding it. To him, poverty is the lack of capability to function, so reducing it is related to positive freedom What is important to people is to be able to do and be".

Apparently, utilitarianism is the ethics of free-market economics; and therefore, there is value in observing it and in trying to generate an alternative measure of the goodness of a state of affairs. Such a measure may also be used to legitimize public policy which is not aimed at simply maximizing the accumulation of capital.

Furthermore, utilitarianism in its original form was a sort of appeal to governments to let the market do its work without interference, to justify self-seeking by proving that the greatest good for the greatest number is achieved by individualistic self-seeking As a guide to public policy therefore it was simply an advice to do as little as possible, within the limits imposed by avoiding lawlessness, social instability and war.

Sen asks a deeper question raised by the critique of utilitarianism as public policy framework, as to what, if any, justification is there for assuming that in a community there is any agent having the legitimacy to choose one state of affairs over another and determine public policy accordingly, or, more specifically, where such legitimacy may lie

Sen's book, Collective Choice and Social Welfare, attempted to rescue welfare economics from free-marketers, who argued that there was no point in government intervention, and that individuals should be left to choose whatever the market made available in response to their choices, and concluded that authoritarian choices had to be made by governments on other peoples' behalf Sen argued that perfection in social decision-making is unnecessary. Partial comparisons between people can help and majority decisions do carry weight, as long as the interests of the less assertive citizens are included In developing his theory, Sen has been exceptionally brilliant in moving from micro/individual to macro/social and from general/formal to specificity/context by solving the tensions between micro and macro, or the individual and the social

The key issue now is how his contributions will be taken forward

Can the Oil Sector Solve the Problem of the Fiscal Deficit in Bolivia?

Sergio Mauricio Medinaceli Monrroy

The answer is no, at least in the short term. I wanted to begin with the answer in order to motivate the reading of a problematic topic, namely the relationship between the extraction of petroleum and natural gas and its fiscal contribution in the form of royalties and taxes. In what follows, I want to present some points on a subject that, although obvious from the numbers, do not seem to be common knowledge.

Before beginning let me delimit the object of study. The productive activities of the oil sector are generally divided in two groups: a) exploration and extraction and b) refinement and commercialization. Usually the first group is called the upstream sector and the second downstream; transport services are sometimes considered as a separate group, mid stream, or within the other two groups. The present discussion will concentrate on the upstream, because the taxes which the downstream pays are generally transferred to the final consumer. Therefore the fiscal burden in this sector will depend on the fiscal and energy policy of the moment, and therefore, the discussion between the downstream and the fiscal deficit loose relevance, since the last could be solved through a strong local tax burden on the final prices of products derived from petroleum.

Table 1 presents the gross value of the production of natural gas and petroleum (GVP) in Bolivia (as percentage of GDP), the deficit of the Public Sector (PS) (also as percentage of GDP) and the difference between the two concepts, during the period

1 The methodology to calculate the royalties and taxes from the upstream sector can be found in Muller & As. *El Régimen Impositivo en el Sector Hidrocarburífero en Bolivia*. # 126. 2003

1990-2002. According to the National Statistical Institute, GVP does not include the payment of operation services, but it incorporates the following concepts: a) payment of royalties and taxes, b) operation expenses, c) capital expenses and d) company profits. On the other hand, the deficit of the PS presented here considers the cost of the reform to the pension's system implemented in second half of the nineties but do not take account the upstream royalties and taxes1.

What does this table say? That, if in the last six years the upstream sector in Bolivia had given the total of its gross income to the State, assuming an irrational situation in which the company, for example, is become indebted to cover its operation and capital expenses and obtains zero benefits, this payment had not been sufficient to cover the PS deficit (see Annex). Moreover, this situation exists independently of whether the sector is administered by the State or the private sector, since the numbers exclusively depend on the volumes of production and the sale prices.

Table 1: Comparison between the Gross Value of Production of Natural Gas and Petroleum (GVP) and the Public Deficit

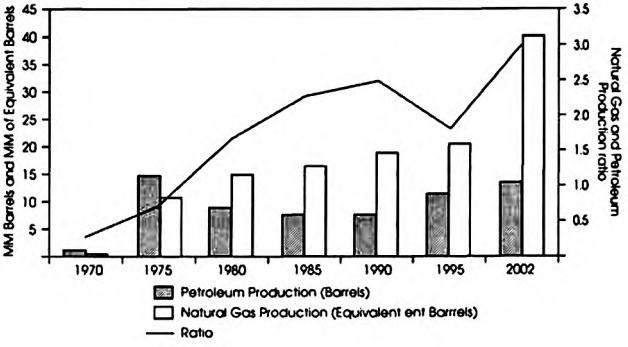
Year	Gross Value of Production (% GDP)	Public Deficit without Upstream Royalties and Taxes (% GDP)	Difference (% GDP)
1990	8.7%	8.1%	0.6%
1991	7.7%	7.9%	-0.2%
1992	6.5%	6.9%	-0.4%
1993	5.5%	9.3%	-3.7%
1994	4.5%	5.1%	-0.6%
1995	4.7%	3.8%	0.9%
1996	4.9%	3.4%	1.5%
1997	4.3%	4.8%	-0.5%
1998	3.7%	6.4%	-2.7%
1999	3.7%	5.2%	-1.5%
2000	5.9%	6.7%	-0.8%
2001	7.7%	9.7%	-2.0%
2002	8.4%	11.4%	-3.0%

Source: National Statistical Institute, Fiscal Programming Unit
Elaboration: Medinaceli

Then the following question arises: ¿Why is there a belief that the upstream business in Bolivia is worth billions of dollars? I found that a reasonable explanation is the amount of investment that the sector has received lately. According to numbers published by the State Oil Company (YPFB) the accumulated investment during the period 1997-2002 is greater than $US 2.600 million and it appears that the public tends to relate the total level of accumulated investments to the gross income of the sector. What happens is that the capital returns in this sector are very low due to the reduction of external demand and, more importantly, due to the low price of natural gas in both external and internal markets

In the second part of this article I will try to elaborate on the last sentence of the previous paragraph, the low capital returns and the low natural gas prices. Figure 1 presents the production of petroleum and natural gas since 1970, in barrels in the case of liquids and in barrel equivalents in the case of natural gas, and the ratio between the two on the right axis.

Figure 1: Natural Gas and Petroleum Production



During the seventies the petroleum production was greater than the natural gas production; in this period the ratio presented is smaller than one. However, since the eighties the natural gas production has been greater than that of liquids. For example, in 2002, Bolivia obtained 3 barrel equivalents of natural gas for each barrel of petroleum. Certified reserves of petroleum and natural gas in Bolivia suggest that this trend will continue in the future, that is, natural gas production will increase faster than the production on liquids.

Which are the problems with this tendency? The first problem becomes clear when comparing the prices of natural gas and petroleum. Whereas the price of petroleum typically fluctuates between 18 and 25 $US/barrel, the price of natural gas, in terms of barrel equivalents, oscillates between 5 and 6 $US/barrel in the domestic market and between 7 and 8 $US/barrel in the external market, that is to say, the price of natural gas is, approximately, three times inferior to the price of liquids. If we add the respective costs of exploration and operation for petroleum and natural gas fields (between 1 and 3 $US/barrel) we find that the yields from natural gas are very low in Bolivia.

The second problem arises from the process of commercialization. Whereas there is a relatively well-functioning world market for petroleum, and thus no need for medium or long term contracts (although they might be desirable), the case of natural gas is completely different. Due to the very high costs of investment for transport and conversion of natural gas, long term contracts will necessarily have to be made. Therefore the initiation of a natural gas project requires of certain temporary consistency in the handling of energetic and fiscal policies.

Certainly, our natural gas is an asset that must be exploited rationally and efficiently, nevertheless, it is necessary to take into account that the yield of this industry is quite low compared to the yields of petroleum, and therefore, the possibility that its fiscal contribution increases will depend, to a great extent, of the capacity to attract long term contracts at reasonable prices. It is thus unreasonable to expect that an inherently long term business could solve (maybe could help) the country's short term fiscal problems, although with wise policies it can clearly make substantial contributions in the long run.

ANNEX

$$GVP_t = NR_t + Opex_t + Capex_t + GT_t$$

Where:
GVP_t = Gross Value of Production
NR_t = Net Revenues for private company
$Opex_t$ = Operation Expenses
$Capex_t$ = Capital Expenses
GT_t = Government Take[2]

$$PD_t = R_t - TE_t$$

Where:
PD_t = Public Deficit without the upstream royalties and taxes.
R_t = Total government revenues from other sectors
TE_t = Total Expenses

$$D_t = NR_t + Opex_t + Capex_t + GT_t - (R_t - TE_t)$$

Where:
D_t = Difference between GVP_t and PD_t

For the period 1990-1995 the term NR_t was part of PD_t, but since the New Hydrocarbons Law NR_t become part of the private sector revenues.

2 Jhonston Daniel. *International Exploration Economics, Risk, and Contract Analysis*. Penn Well Corporation 2003.

A Politico-Sociological Account of Donor Practice and Aid Effectiveness: Donor-Recipient Relationships in Bolivia*

*Bettina Woll***

This discussion paper intends to stimulate debate on an often neglected subject: the socio-political aspects of donor practice and their relation to the effectiveness of development cooperation programs. It does so with reference to donor-recipient relationships in Bolivia – a country in which donors take an unusual interest since the structural reform era of the 1980s. After more than two decades of democracy and twenty years of structural reforms, Bolivia now stands at a crossroad of political and economic development. The last few years of economic and social crisis have further emphasized the fact that Bolivia – the model student of the World Bank's structural reform programs – has not achieved the level of economic growth and poverty alleviation that its governments, its civil society and its present donor community had hoped for. Despite Bolivia's success in achieving macro-economic stability, 64.5% of the population continue to be poor in 2002. Between 1999 and 2002, the economy grew at 1.7% – an economic growth rate lower than population growth during the same period. This has resulted in a decline of the BIP per capita of 0.4% per annum.[1] To many involved, these disappointing figures come as a surprise. Between 1998 and 2002,

* This article is an introduction into a Ph.D. research project on donor-recipient relations in Bolivia. The author wishes to thank the Development Studies Institute (DESTIN) of the London School of Economics and Political Science (LSE), the Jackson Lewis Scholarship of the LSE and the University of London Central Research Fund for their generous financial support of this project.

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1 República de Bolivia (2003) "Revisión de la Estrategia Boliviana de Reducción de la Pobreza 2004-2007. Bolivia - Una Alianza hacia las Metas del Milenio", XV Grupo Consultivo, Septiembre, La Paz: 2-4.

Bolivia has received an average of US$ 616 million in official development assistance (ODA), which makes it the largest aid recipient in South America [2] In addition, Bolivia was the first Latin American country to be considered under the Highly Indebted Poor Country (HIPC) Initiative. It received US$ 448 million debt relief in 1998, and an additional US$ 854 million through the Enhanced Highly Indebted Poor Country Initiative (HIPC II) in 2001.[3] The Bolivian government and its aid donors alike struggle to find an explanation as to why these monies have not propelled Bolivia's development.

Within the international donor community, emphasis has recently shifted from structural reforms to institutional strengthening. The argument brought forward is that structural reforms can only be sustainable when sound and effective political institutions support them. For that reason, donor cooperation with Bolivia has focused to a large extent on institutional strengthening and political reform, particularly with respect to decentralization and civil society participation. Progressive innovations, such as the Law of Popular Participation and the Law of the National Dialogue have further strengthened Bolivia's image as a "donor darling". Its reforms have appealed to and attracted a substantial amount of aid money in the field of political and institutional reform. Some donor countries actually have their largest political reform programs in Bolivia. The focus of many of these programs has shifted to power relations, clientelism and corruption–in short: failure of the Bolivian government. These might well be worthwhile problems to solve. Yet, the present article argues that one particular aspect is continuously neglected when discussing the many causes of donor assistance's unsatisfying effectiveness. How does the way in which donors operate impact on the effectiveness of their programs? In a country like Bolivia, where donor agencies are very influential, the author argues that donors have to be conceived as socio-political actors. Few people ask to what extend the way in which donors interact is a cause of failure of recipient governments. To shed light on this issue, the article will first discuss standard donor practice.[4] To do so, it will examine donors' guiding principles and their coherence, internal incentive structures and the contexts in which donor action takes

2 Organisation for Economic Cooperation and Development (2004): Geographical Distribution of Financial Flows to Aid Recipients 1998-2002, Paris: OECD.

3 Net present value. World Bank (2003): "HIPC Initiative: Status of Country Cases Considered Under the Initiative", September, Washington D.C.

4 This analysis is based on the accounts collected during a series of interviews conducted in Europe and Bolivia between March 2003 and March 2004.

place. In a second step, the article will discuss differences in perceptions and the use of language between the donors and the recipient organizations. To do so, it examines the attributed importance of state-civil society relations and investigates into what constitutes genuine local ownership. To conclude, the author recommends donors to increasingly reflect on their own actions to increase the effectiveness of their aid programs.

Donor Practice

Donor agency functionaries tend to come with an academic view on political and economic change in Bolivia that perceives themselves as external observers and their work as politically neutral.[5] From this standpoint, donor agencies supposedly have better solutions to Bolivian problems than the government, whose different parts are perceived to be engaged in power struggles and clientelistic relations that are perceived as hindering them from initiating change. Yet, donor functionaries come with an intrinsic agenda, with values and principles. They play a particular role in Bolivian state-society relations and thus form part of the country's socio-political context.

Guiding Principles and Coherence

Although the donor community is far from homogenous, its international nature makes it share particular principles to guide donors' work. These evolve from the international academic literature on donor practice and development issues as well as from new priorities put forward by the United Nations system, which includes the World Bank Group. Although such principles are not stable over time, today's priorities can be identified with reference to current debates within the development community. The development community today focuses on economic growth and poverty reduction with respect to economic development and on civil society participation and administrative decentralization with respect to political reform.[6] On a technical level,

5 Several donor agencies have considered policy influencing as a means of inducing political reform. However, these policy influencing tools hardly ever consider the unintended consequences of their intended action - which are vital for comprehending socio-political interaction.

6 The importance and relationship between poverty reduction and economic growth is discussed in World Bank (2001): World Development Report 2000/2001: Attacking Poverty. New York: Oxford University Press. For the relationship between participation and decentralization, see United Nations Development Programme (1993) Human Development Report 1993: People's Participation. New York: UNDP.

the principles of aid effectiveness and aid efficiency are emphasized [7] With respect to development cooperation between the international donor and the recipient government, the development community wants to forge partnerships in development and foster national ownership of cooperation programs [8]

Table: Donor Principles

Country Development Cooperation	*economic*	economic growth	poverty reduction
	political	decentralization	participation
	technical	aid effectiveness	aid efficiency
	relational	equal partnership	national ownership

Source: own design

The present article can only touch upon these principles without discussing them in detail Although each one of the principles might make sense in and for itself, the combination of them presents some problems as to their realization For example, there is a tension between swift and efficient political reform and extensive civil society participation throughout the process. Or, how can poverty alleviation be achieved while guaranteeing national ownership of the program when poverty alleviation is just not a government or civil society priority? On a similar note, equal partnership between a donor and a recipient might reduce aid effectiveness in a country like Bolivia where the recipient governments change frequently These tensions might not be unsolvable, but require a certain extent of self-reflexivity and prioritization on the part of the donor community Otherwise, both the donors and recipients will use such popular "buzz words" to blur interests of a different nature This would deprime the above mentioned principles of their content

Internal Incentive Structure and Contexts of Donor Action

One of the root causes of these paradoxes is the way in which donor agencies are structured The personal career of a donor functionary to a great extent depends on the success of its programmes and projects, which is usually documented by the production

7 For a discussion of aid effectiveness and efficiency, see World Bank (1998) Assessing Aid What Works, What Doesn't and Why, New York Oxford University Press

8 For a critical discussion of origin of 'ownership' and 'partnership', see Alf Morten Jerve (2002) "Ownership and Partnership Does the New Rhetoric Solve the Incentive Problems in Aid?" in Forum for Development Studies 29 (2) 389-407

of government reports, the financial budget of a program and the like. There is an intrinsic need for the individual donor representative to spend the budget, so that its program will continue to exist in the future, and to deliver presentable results, such as the production of a PRSP or the organization of a National Dialogue in case of Bolivia In contrast, there is no incentive to comprehend and take into account the country's socio-political sphere – which would improve the sustainability of programs – as long as programs appear to run relatively smoothly. In addition, because donor representatives want their programs to have an impact, they tend to engage in the same clientelistic networks that they criticize among their government counterparts. Such networks might be necessary to ensure the efficient execution of their programs. Yet, they are in stark contradiction to donors' call to institutionalise career functionaries on the basis of merit–a call that is particularly emphasized in Bolivia.

Apart from their guiding principles and internal structure, donors' work has to be perceived in the light of the role they play within the recipient country's state-society relationship. Donors constitute important socio-political actors because of the economic and political impact that their aid money has on national political and economic processes. Because of that, donor functionaries are attractive to socialize and to cooperate with From a politico-sociological perspective, they constitute a specific group within a country's state-society relations. This fact is often neglected in the analysis of socio-political reform Too often, country politics and social movements are analysed without taking the donors' role and function into account. Yet, one feature distinguishes the donor community from any other social group. Donors do not only interact on the national level. They also form part of the international development community, which includes all practitioners in development worldwide as well as academics working on the subject, and of their civil service 'back home.'[9] In that respect, they are integrated and interacting within three different contexts – the national context, the international development context and their own civil service context – that determine their actions.[10] This is important to note when analysing donor activities on a country level. To give an example of the Bolivian case, the donor's role in supporting the Bolivian Poverty Reduction Strategy Paper (PRSP) was more likely a response to the international development community or to the requirements of

9 Rosalind Eyben (2003) "Donors as Political Actors", IDS Working Paper 183, Institute of Development Studies, April, Brighton 7-11.

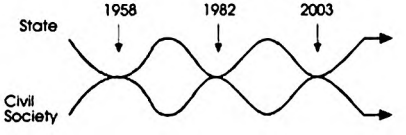
10 Rosalind Eyben (2003) "Donors as Political Actors", IDS Working Paper 183, Institute of Development Studies, April, Brighton

their civil service back home, rather than only a reaction to political processes in Bolivia As we will later see, this might lead to problems related to the national ownership of the PRSP and to deficiencies of its implementation and sustainability

Perceptions and the Use of Language in Cooperation

Apart form the neglected socio-political role that donors play, one other feature of development cooperation is consistently underestimated There is an apparent gap between cooperation 'rhetoric and reality,'[11] a fact of which both donors and recipients are nonetheless usually well aware, at least in theory[12] Nevertheless, this gap has distortive effects when results of the rhetoric are taken as reality and are included in subsequent cooperation programs. For example, perceptions and understandings on the two Bolivian National Dialogues largely differed between the donor community and the Bolivian governmental and non-governmental organizations Arguably, donors saw the Dialogues as a constructive engagement with civil society, whereas several government officials initially saw it as a means to secure debt relief[13] Donors today regard the PRSP – their main priority – as the essential outcome of the second Dialogue process, based on official statements of the government. However, informally government official claim that the PRSP was instead the work of technocrats, while the most important outcome of the second National Dialogue was much rather the Law of the National Dialogue, which institutionalizes continued interaction with civil society[14] As a result, this means that the donors expect the government to follow up on the PRSP, a process in which the government itself has much less interest than the donors

Graph: State - Civil Society Interaction



11 For analytic examples, see Peter J Schraeder (2002) *Exporting Democracy Rhetoric vs. Reality*, Boulder: Lynne Rienner

12 Interview with a donor representative, 6 August 2003, Frankfurt, Germany

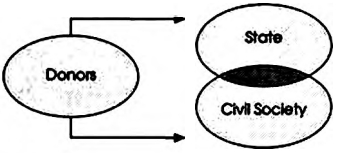
13 Interview with a Bolivian government functionary, 22 January 2004, La Paz

14 Interview with a Bolivian organiser of one of the National Dialogues, 3 February 2004, La Paz

Donors and Bolivian State – Civil Society Relations

A particular feature of the Bolivian context is that the sphere of interaction between the state and civil society is actually very small. This runs counter to common understandings of the role of civil society in current development debates. There, civil society is perceived as an integral part of the socio-political context, which acts as a check and balance to government policy formulation. In Bolivia, however, the intention of several civil society organizations is not to provide input for policy change, but rather to change the political system as a whole.[15] This fact makes the interaction between government and civil society particularly confrontational – not directed towards the kind of policy outcomes that donors are hoping for. The Bolivian sociologist Zavaleta Mercado has described the interaction between the Bolivian state and its society as a returning cycle.[16] In particular moments in Bolivian history, the state and civil society have confronted each other. Yet, this has not happened in an interactive and cooperative manner but rather abrupt and opposing. Apart from these encounters, both do not usually engage with each other in a constructive way.

Graph: Donor Relations with the State and Civil Society



Source: own design

In the case of Bolivia, donors cooperate with representatives of state organizations as well as with representatives of civil society groups. However, this is done in a bilateral fashion, where each donor agency has its government counterpart on one hand and its civil society counterpart on the other hand to cooperate with. This results in a distorted picture of the Bolivian state-society relationship: donors might know very much about how the state functions or how civil society is organised. However, they know very little

15 Interview with a Bolivian government functionary, 28 January 2004, La Paz.

16 Zavaleta Mercado has mainly referred to Bolivia in authoritarian times. However, this logic can arguably be extended until today. René Zavaleta Mercado (1988) "Consideraciones sobre la historia de Bolivia", in González Casanova (ed.), *América Latina, historia de medio siglo*. México: Siglo XXI

about how the state and civil society interact This lack of knowledge makes it impossible for donors to comprehend the social origin of Bolivian politics In such a situation, donors are not more than educated technocrats who work on specific projects without being able to situate them in the socio-political country context "Each donor has its poor" but the socio-political causes of poverty remain poorly understood.[17] As a result, donors are not able to induce the favored policy change that they consider necessary for Bolivian development

The Question of Ownership

As for the cooperation between donors and the government as well as with civil society organizations, there is pressure on the donor's counterparts to use donor concepts and language in order to receive funds or debt relief Although this might not be a problem when concepts happen to converge between the donors and the recipients, more often recipients employ 'donor language' without agreeing on the concepts This endangers the donors' current principle of fostering national or local ownership of a particular program To give an example, large amounts of aid money have been used for feasibility studies and the design of projects and programs in Bolivia within the last ten years, particularly with social service ministries such as the Ministry of Education The majority of these programs have never been implemented, either because of a lack of qualified staff or because of a lack of motivation within the government to follow them through.[18] This disappointing implementation turnout could have been avoided if donors had measured ownership not only by the mere declaration of intent of their government counterparts In sum, the ownership 'problematique' is directly related to the well-known gap between rhetoric and reality Although donors might be aware of the gap, they tend to think that once policies are formulated and"institutionalized', the government will feel obliged to follow them through The stalled poverty reduction process is another illuminating example Such hope is nourished by the many academic works on 'institutional design' as the basis of achieving political change Yet, a look at the socio-political roots of politics and polity makes one question whether institutional change is all that is needed to transform a

17 Concept and quote from an interview with a Bolivian organiser of one of the National Dialogues, 27 February 2004, La Paz

18 Interview with a Bolivian government functionary, 26 November 2003, La Paz

political system. In the Bolivian case, one can argue that informal rules and procedures are equally, if not more important.

Outlook: Increased Donor Reflexivity

In the light of the above arguments, it should be clear that donors cannot foster national ownership of a program such as the PRSP, that is simultaneously tied to policy conditionalities like poverty reduction and civil society participation. In such a case, the donors have to prioritize their principles and be frank about whether, say, ownership or poverty reduction comes first. If donors do have an interest to foster national ownership of cooperation programs, they will have to develop a better understanding of what issues matter in the socio-political context of the country. To do so, they have to become sensitive as to what is discussed within the interaction between the state and civil society. Such issues are much more difficult to generalize and probably not applicable to the world as a whole, as was done with poverty reduction. In Bolivia, issues to address could be the upcoming Asamblea Constituyente and the Referendum – two issues which are high on the political agenda of both government and civil society in Bolivia today.

The above illustrations do not aim at criticizing the donors for their 'naïve' setting of principles and use of language, nor the Bolivian government for their uncommitted stance towards many of its own policies. Much rather, this discussion paper wants to initiate a debate as to why the donors actions and principles or the government's reactions and use of language can be problematic and counterproductive for the achievement of aid effectiveness. In any sphere of political negotiation, principles are established and language is adapted in order to facilitate cooperation. However, it must not be forgotten that the relationship between the donor community and the recipient government is an unequal one, at least in terms of financial power. The language of partnership tends to blur this fact in an unhelpful way. Donors need to be more reflexive on this highly sensitive issue and formulate policy approaches accordingly. They can use socio-political analyses of the country context to identify desired reforms that are feasible.

Human Capital vs. Screening Hypothesis: An Exploratory Analysis of the Labor Market of the City of La Paz*

Fernanda Padrón

Research has revealed the benefits that educational investments have on economic growth and social welfare. Among the topics studied, the effect on income distribution is one of the most important; it has been shown that the differences in the level of schooling represent the main explanatory factor of wage differentials.

Hence, educational investment is considered a primary force to fight poverty and inequality. It is believed that if qualification gaps between population groups are reduced – through more and "better" education –, it will be possible to reduce income gaps.

In Bolivia, the Education Reform Program (PRE) has required a major financial effort throughout the last four governmental periods. During 1990-2001, current expenditure on education increased from 3.1% to 5.6% of GDP and education investment in elementary schools from 0.0019% to 0.525% of GDP. In total, $361 million were designated to investment projects.

Even though there hasn't been a systematic examination, there are clear results from this process. For instance, the gross enrollment rate in elementary school increased from 96.6% in 1990 to 107.7% in 2000. In addition, during 1997-2000, the abandonment and reprobation rates in elementary decreased from 9.4% to 5.9% and from 7.1% to 4.4%, respectively.

* Number 723 of the collection of thesis (Department of Economics - UCB)

However, it's not evident that these results turn into immediate improvements of welfare levels. From a private point of view, studying is profitable because it increases salaries. Nevertheless, private profitability doesn't necessarily imply social profitability.

Economic theory describes this dilemma with two explanatory models of the role of education in the generation of earnings. On one hand, the Human Capital Theory declares that education increases salaries because it raises the productivity of workers. From this perspective, education not only benefits individuals with higher wages, but benefits society in general with the enhancement of productivity. On the other hand, the Screening Hypothesis states that education has no effect on labor productivity, that it is merely a signaling device that employers use to select the more skilled workers. Since there is no gain in productivity, according to this theory, the benefit of educational investment is smaller.

The effect education has on productivity is essential when deciding the importance given to school quality. If education did raise the students' productivity, it could be considered that differences in productivity between individuals are due, among other factors, to differences in the quality of schooling they received. If, in contrast, education couldn't affect productivity, school quality would be irrelevant. Likewise, the government's effort to improve the educational system would only be effective if education could influence the students' productivity. If the opposite were true, the current educational policy would represent over-investment in education.

Thus, the objective of this dissertation is to provide empirical evidence about the role that education plays in increasing earnings. For this, it analyzes the existing connection between the level of schooling, school quality, natural ability and earnings.

Due to the inexistence of information concerning school quality and the innate ability of workers, this investigation uses a database built with surveys and tests applied to a sample of 253 people of the city of La Paz[1]. The survey gathers information referring to personal characteristics, family background, schooling process (level of instruction, inputs of the educational process, and student's performance), and occupation. The ability of each person was measured with an intelligence test (Dominos

1 The sampling was done through a two-step stratification process of the censual zones of the city of La Paz using the Poverty Magnitude Index as a proxy for the level of income, the stratification variable.

Test), with which it was possible to segregate the intellectual quotient of the people surveyed into three ranges: inferior, equal or superior to the average capacity.

The econometrical analysis uses the Human Capital Earnings Function to examine what factors the labor market remunerates; more specifically, how it remunerates innate ability, the level and the quality of education received by the individuals.

Therefore, the dependent variable, in all cases, is the natural logarithm of the income measured in Bs./hr. On the other hand, the principal independent variable is schooling, measured in years or completed levels; the others are related to the quality of education –inputs and outputs–, innate ability and socioeconomic background.

This study uses educational quality as an approximation of productivity. In this way, differences in human capital are represented through indexes that include variables related to the quality of educational inputs (access to "key" facilities) and outputs (student's performance).

The analysis is divided into four sections. The first section estimates the basic model which includes standard variables and others referring to school quality and innate ability. The second classifies schooling by completed level or credentials acquired. The third considers the endogenousness of the years of education. Finally, the fourth studies only individuals who have completed all university credits or are finishing the fourth or fifth year, correcting selection bias through Heckman's methodology. In every section, both the coefficients and the FIW[2] of each variable are examined.

The diverse specifications of the model used reveal a positive relationship between schooling and earnings. In all cases, education is the most significant explanatory factor of the total variation of earnings.

The years of education have different importance depending on the level in which they are studied: elementary and secondary school years are irrelevant to the regression, and post secondary school years highly significant. Out of the three post

2 Factor Inequality Weights, Fields' methodology used to decompose the total variation of the dependent variable explained by each independent variable

secondary options considered –university, technical school and–"normal"[3]–, university is the most profitable and the only one important for the explanation of income

When analyzing schooling by credentials, the high school diploma turns out to be greatly significant in the regression Alternatively, finishing technical or "normal" school is not significant and does not explain any of the variance of income Finally, university graduation explains almost a fourth of income inequality

Combining the results from the regressions that estimate schooling through the years spent in each level and by completed levels, we can see that the high school diploma seems to be more important than the years studied in school, whereas for technical and "normal" school, graduating isn't relevant, but the years spent in the level (however, these two levels are not important for wage differentials) For university, both graduation and the years studied are important

It is found that ability is positively related with income through two mechanisms In the first one, the labor market remunerates ability directly According to the results obtained in the different specifications for the entire sample, the more capable individuals earn more Ability is the third most valuable explanatory factor of income

The second mechanism relates ability indirectly with income through higher schooling In the university and post university sub sample model, it can be seen that a higher intellectual quotient increases the probability of completing four or five years of college Likewise, when the income regression of this sub sample is run, ability ceases to be significant in the explanation of earnings even before the insertion of the selection term, which suggests that the people in this group have similar ability Moreover, when regressing the years of schooling, the IQ is the second most important explanatory factor of the variation of schooling among individuals, the most able study more years

No substantial evidence can be found for the direct remuneration of educational quality in the labor market since the only case in which the human capital index turned out to be significant was when schooling is examined through completed levels

3 School teacher education

However, we found an indirect relationship between quality and earning, through schooling. In the selection model of the university and post university population, it can be seen that both input and output quality increase the probability of graduating or being in the fourth or fifth year of university. Likewise, the regression of years of schooling shows that input quality is the most important factor to explain the differences in schooling among the people surveyed. Output quality explains 5% of these differences.

The results presented expose mechanisms from the screening hypothesis and the human capital theory. There has been found evidence that the most able are the ones best remunerated by the labor market and, also, the ones who attain higher levels of education. However, it was also found that individuals who reach higher levels of schooling are those who have had "better" educational quality, with respect to access to "key" inputs, and have had a better performance when studying.

More specifically, in the sub sample studied, it can be seen that the most able and those who had a better educational quality are those who conclude their university studies or are about to conclude them. Therefore, the completion of university can be a good "signal" not only to choose the more able workers, but to select the most productive"–those who have accumulated more or better human capital during their educational process.

On the other hand, evidence found indicates that, within the university group, human capital differences are not remunerated. The conclusion of this educational level can "signal" more able and more productive individuals with respect to the entire population, but once they are chosen, the labor market doesn't remunerate differences in productivity or ability within the group. The earnings regression for the sub sample shows that differences in the level of schooling (post university studies) are, once again, the most important factor to explain wage differentials.

In this regression, university dependency is significant and important when explaining earnings even after including the variable referring to differences in educational quality (human capital index). The 59% negative effect against those who have studied in a public university is not defined by quality differences.

On one hand, it could be that part of the adverse effect related to the university dependency has to do the variety of offered careers because some are better remunerated than others. On the other hand, it is possible that employers use university dependency as a "signal", not necessarily of a better quality of education, but of certain socioeconomic and cultural characteristics that they consider desirable. It may also be that, in private universities, social links that allow the acquisition of well paying jobs can be established. In this case, the university diploma would permit access to better positions, but the "contacts" would be determinant. This hypothesis could also be sustained by the direct relationship between parents' and their progeny's earnings - second most important explanatory factor of earnings-, since it gives some evidence that the hiring process is defined, in a certain degree, by the economic and social circle of people. All these hypotheses demonstrate the need to elaborate more in-depth studies about the labor market imperfections and their consequences.

This research has found that differences in the level of education of individuals act as a "sign", not only of innate ability but of productivity acquired during the educational process. Within this "signaling" mechanism, human capital also matters. Educational quality allows people to attain higher levels of education, presumably because it increases their productivity. In this way, differences in educational level - since they represent contrasts in educational quality - may help select the more productive people. Apparently, the labor market does not distinguish productivity differences, but it-does remunerate them through the "signal" of the education level.

From public policy perspective, improving the quality of the educational system would be important because it would increase students' productivity and their schooling level. However, to assure the profitability of educational investments, the government should complement educational policy with labor policy. If the imperfections in the labor market could be reduced, it would possibly allow the market to remunerate productivity differences more directly, without needing any "signaling" device. For example, they should try to enhance staff recruitment information systems and hiring processes. This way, hiring processes would be more efficient and merit-based.

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