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INTRODUCTION

Joseph Stiglitz and Michael Toman welcomed the participants to the workshop. Prof. Stiglitz outlined the Initiative for Policy Dialogue's three broad areas of activity—task forces on specific issues, country dialogues and the journalism training program. Debates on development strategies have often tended to be narrowly focused on the prevailing orthodoxy, and it is important to open them up to include more ideas and participants. Task forces build a foundation of intellectual capital and focus on the differences between the circumstances faced by developing countries as compared to more developed nations.

Joseph Stiglitz noted the importance of environmental issues to successful development and improving living standards. IPD task forces, including the present one, will publish their contributions as part of the IPD Book series. Each task force will also bring out overview volumes more accessible to a broader audience. These publications are in line with the intent of impacting the debates among professionals, policy makers and civil society. In this light, the papers should distinguish how environmental policies are different for developing countries. For example, many think environmental issues are a luxury only afforded by developed countries.

Shari Spiegel commented that a frequent expectation is for an "IPD view" on economic policies. In her opinion, disagreements between constituents of IPD are often constructive, especially in contexts and countries where there are no, or limited, debates. Joseph Stiglitz noted that there was indeed no need to reach a consensus in the course of the meeting, except on the extent of coverage of issues by the task force.

Papers prepared for the meeting should follow journal-quality norms in highlighting challenges of developed versus developing countries. They should also be rich in perspective and treat micro, macro, trade and institutional issues in their take on the environment, as opposed to the earlier literature's tendency to be restricted to a

microeconomic approach. The meeting's purpose was to enable vetting and peer review. Joseph Stiglitz added that participants may be asked for detailed reviews of each others' papers and self review. On the subject raised by Jon Strand of overlaps between papers, Michael Toman indicated that efforts would be made to streamline them and ensure that chapters complement each other.

1. RESOURCE DEGRADATION IN DEVELOPING ECONOMIES – ISSUES OF POVERTY, POLITICAL ECONOMY AND MEASUREMENT

1.1 Resource Degradation and Poverty: "Dualism within dualism"

Edward Barbier's presentation focused on structural themes, especially relevant in the context of rural poverty, and natural capital. The key concept his paper puts forward is "Dualism within dualism." The first of these dualisms is that of aggregated resource use and resource dependence for low and middle income countries: most of these economies are highly dependant on the exploitation of natural resources for export earnings and development. The second dualism pertains to the concentration, within these countries, of population living in poverty in marginal areas—converted wetlands, poor quality uplands, and frontier areas.

Resource use in the world appears to follow four stylized facts. The majority of low and middle income economies are resource dependent. Moreover, there is increasing evidence that the greater the resource dependence, the poorer the economic performance, whether measured by growth or poverty reduction. Third, development in low and middle-income economies is associated with increased land conversion and stress on available freshwater resources. Finally, there is a concentration of a significant proportion of the very poor (including those surviving on less than 1 dollar a day) on fragile lands. Currently, a quarter of people in developing countries or 1.3 billion people are estimated to live on fragile lands.

Despite the existence of credible data, there is little explanation as to why these phenomena exist. Three-fourths of 96 countries have a concentration of primary products of more than 50% in their exports, and for these countries, two main commodities accounted for about 60% of total exports.

Toman asked what would happen to the data if oil production and export were removed. Barbier replied that the inclusion or exclusion of oil made little difference. He also pointed out the problem of including or excluding mineral exporters—these merit analysis of instances of mineral export driven success or failures.

Barbier postulated that the idea that resource abundance might be bad (as in the analysis of Sachs and Warner) could be refined to conclude that resource dependency—and not just abundance—has a negative relation to GDP per capita, and tends to be positively correlated with the Human Poverty Index. With regard to land conversion, the FAO has predicted that the demand for additional cultivated land is expected to rise by 47% by 2050, with 66% of new land coming from deforestation and wetland conversion.

Similarly, an analysis of the criticality ratio (of water withdrawals to fresh water resources per year) indicates medium (0.2 to 0.4) to high (upwards of 0.4) water stress in large parts of Asia and West Asia/ North Africa. India, China and faster developing countries are projected to have a good deal of water stress in the near future. There is evidence in the data that many countries are mining ground water or transferring water from other basins. Barbier went onto point out that the total population of the world is increasing and projected to be 8.27 billion in 2030. Although most of the population growth is expected to occur in urban areas, the more resource dependant the country, the higher the rural population growth. The World Bank reports that there has been a doubling of populations on fragile land since 1950. In fact, one fourth of people in developing countries currently survive on fragile lands, particularly in Latin America, Africa and Asia.

Barbier presented two indicators of dualism within dualism. The first, a measure of the degree of resource dependency, is the share of primary commodities in total exports. An indicator of the resource dependency of a developing economy is if the primary export share is 50% of more. The second indicator of dualism is if substantial numbers of the rural poor have livelihoods vulnerable to resource degradation and poor income prospects. One way to measure this dualism is the 20/20 rule: if 20% or more of the country's population lives on fragile land and 20% or more of its rural population lives under conditions of absolute poverty.

Using these two indicators, some 54 of 72 economies display both types of dualism. Further, many countries with a lower primary product export concentration have high proportions of their population living in fragile areas and rural population in absolute poverty.

Barbier stated a key paradox is why, even as natural resources are important for economic development, resource dependence can become a hindrance to economic performance. Hypotheses have included failed institutions, the idea of a "resource curse", and the welfare reduction faced by resource dependent economies with open access resource exploitation on opening up to world trade. These do not explain why resource-based development should be bad in itself, especially given the counter-evidence of mineral-based development such as in Chile and Peru. There are 3 key issues: first, natural resource endowments must be continually enhanced through country specific knowledge in the resource extraction sector. Second, there need to be linkages between the resource sector and other dynamic economic sectors and third, there must be substantial knowledge spillovers arising from the extraction and industrial use of resources in the economy.

Lopez questioned whether it is a paradox that the poor countries are also those with a high share of resource exports. If the same problem is reinterpreted as one of non-resource exports (manufacturing) being low in poor countries, and it is observed that a low non-resource export share is associated with poverty, a different set of explanations can emerge. Barbier commented that the key paradox is that countries should be able to reinvest the rents from resource ownership, something that evidently does not happen.

Stiglitz also observed that wealthier countries ought intuitively to perform better economically. All things being equal, a country with an endowment should do better. The question, then, is why they can't convert this resource wealth into growth. Barbier's first dualism ratio (of share of primary exports in total exports) would not capture the wealth of a country adequately.

Barbier noted that there are caveats to the resource dependency explanation, in particular the case of mineral based growth.

The frontier expansion hypothesis was debated. Barbier felt the existence of political and market failures in the resource sector work against resource based development in poor countries. Inequalities in wealth between rural households also have impact on land degradation and deforestation; this is why so many poorer households find themselves confined to marginal lands. Also, government policies that favor wealthier households in markets for key resources such as land have major effects.

While frontier land expansion is often associated with economic expansion, this is not necessarily a positive development in the case of developing countries. Expansion into fragile land is often an outlet for the rural poor in conditions of intensive agriculture. Lopez noted that these lands have little additional rents (in line with the economic explanation of marginal units being brought into use), and Stiglitz noted that even if the expansion yields rents, these are not reinvested in productive activities.

Toman pointed to the slightly different interpretation in historical literature. Rents for agricultural land tend to be low, while those for mining and value added activities are higher, so that the savings rates associated with different economic uses of land are of relevance in explaining the expansion onto fragile lands.

Barbier added that frontier based expansion is likely not to be integrated with the economy on account of physical distance from urban industrial concentrations and the lack of dynamic linkages including transport. Again, economic agents are attracted to this frontier precisely because of the lack of control (as in the case of open access unregulated timber harvesting).

These factors imply that frontier expansion in developing countries often does not yield long term benefits— it is an outlet for the poorer households, does not generate sufficient rent (though it may account for consumption of non tradables and food for subsistence), and rents in the case of resource extraction are not reinvested, except within in the same resource sectoral enclave. This is all too evident in Thai aquaculture, which expanded at the expense of mangroves. With land disappearing in recent years, the consequence has been an extension of shrimp farming into Vietnam, rather than reinvestment in other sectors of the Thai economy.

Lopez called attention to the instrumentality of policy in two processes: in keeping the profits of activities on the frontier high (possibly artificially so), and in keeping it low in other areas of the economy.

There must be better integration between frontier activities and dynamic economic sectors, including a greater commitment to agro-industrialization. However, the focus on "agro industries" rarely suffices in itself. Barbier pointed out that reforms to improve resource management must address institutional failures. These reforms, such as land reform, tax and credit reform, public investment in primary education and health services for the poor, may be politically difficult but are necessary. He noted that more general rural agriculture policy targets crops or geographic regions, without addressing the difference between people with and without productive resources. There must be specific reforms aimed at improving resource management and productivity of frontier lands, targeted at poor rural farming households. Reducing the propensity for corruption and rent-seeking in resource-based sectors is the biggest challenge. The institutional failures that promote such practices appear to be deep-seated and endemic. Dualism can serve as an important indicator of structural imbalance—of not enough rents from resource extraction, and of not channeling these rents back viably.

Kirk Hamilton pointed to recent literature, including a WIDER volume modeling a similar stable trap and providing case studies. At the macro level, there are aspects at work other than the Dutch disease phenomenon (the idea that exchange rate appreciation due to resource booms can be detrimental to other exports of a country) in explaining the problem of resource dependent economies. One is that resource booms are often used as a period for fiscal spending with less regard to tightening budgets. Further, resource rents are "easy money", and they lower incentives to tighten expenses.

Barbier countered that price booms are not necessary for distortions, and forces other than easy money do operate. A question raised was the extent to which countries could follow the model of Botswana, which, in its resource led boom, has also incorporated substantial discipline. Akbar Noman noted that one factor countries have to contend with is the distortion in world trade, and this is especially so for exporters of renewable resources.

Stiglitz highlighted the political economy puzzle of resource-rich countries with endowments of natural capital. This capital is a public good which, in principle, could enable a more egalitarian society without having to worry about incentive structures. Resource richness, however, also makes for income streams that have a low reliance on the sort of educational system and social infrastructure that are needed for wider participation in the economy. We thus observe resource rich countries with a higher degree of inequality associated with countries with a lower economic performance. The paradox can be explained by the existence of elite sections that seize resource rents and perpetuate themselves.

The subject of colonial origins (as taken up in Daron Acemoglu's AER article) was discussed. Environments hostile to European settlements saw the resource extractive aspects of colonialism to start with, and, by the 1960s, these countries had a heritage of lower levels of dynamic economic activity.

R. Maria Saleth noted that the interpretation of economic activity patterns and associated institutions in a colonial perspective also depends on the resource in concern. Resources amenable to extraction made for colonial activities seeking quick results, while those with longer-term involvement (e.g. tea estates) called for creating institutions and a different interaction with local populations. The British colonial "rent" concept was an economy-wide one, and can explain knowledge spillovers in certain contexts that may not have happened in other countries. Who colonized a country is thus also of importance.

Lopez noted that in the present context, taxation of extractive industries is very low. Chile, as an example, has fairly good institutions, but does not tax copper exports, or even gain substantial rents from them. Stiglitz noted that this is an instance of how political capture explains economic capture, while logic often predicts the relation to be the reverse.

Noman noted that, though taxation of extractive industries might be absent, exchange rate policies between the 1960s and 1980s were an important cause of natural resources being implicitly taxed. Artificially fixed rates meant net resource transfers to importers.

It thus emerged that two dimensions to the so-called "resource curse" are the phenomena of resources not being taxed properly, and, at the other end, resources being taxed too much in distortionary ways.

In this context, Stiglitz noted that in explaining tax policy failure, corruption by itself may not be the relevant variable. A better measure might be what fraction of resource rents from publicly owned resources is captured by the general public.

Lopez pointed to ideology—including that espoused by a particular set of economists in developing country governments in the past—as an important factor that historically thwarted resource taxation. Stiglitz countered that taxing land rents is recognized universally in the economic tradition to be efficient and non-distortionary, so that it seemed odd that economists should not identify extractive industries as one of the first to be taxed. Lopez explained that the argument made was often one of pre-emption—that if resources were taxed, over-taxation would soon result from a reckless extension to non-rent taxes.

1.2 Political Economy of Resource Use and Economic Development

Robert Deacon and Bernardo Mueller presented a framework to examine the relation between property rights, political systems and the "resource curse." Governance provides the institutional matrix for property rights, and, as a resource becomes more profitable, property rights are affected. Political risk, at one level, reduces an individual's incentives to conserve resources. Simultaneously, it makes ordinary capital more expensive, and, for resources that are capital intensive, this impacts the extent and timing of resource extraction.

Joseph Stiglitz noted that this refutes the case often made for giving away resources (to developers) to enable their exploitation for growth. Deacon's argument implied that giving away resources could increase political risk through increasing the illegitimacy of property rights, and could thereby thwart development. In policy terms, this points to the idea that the prescription of international organizations for enhancing property rights is nuanced by the fact that the security of property rights in democratic societies is a function of their legitimacy. The control variable for more efficient resource utilization cannot, therefore be moral suasion to enhance property rights, but should be to secure title to resources and to ensure the legitimacy of the process.

Jon Strand raised the concern that when a resource like land is degraded, there is less of an incentive to establish better property rights, so that there is an element of endogeneity between the variables of concern. As a resource is depleted, it becomes less worthwhile to preserve it through better property rights.

Deacon felt that the often-observed negative impact of resource abundance on growth operates through political institutions. Natural resources can be allocated for private or public use, and governments may be conducive to one or another form of use. Joseph Stiglitz noted that the theoretical position on resources that are concentrated in spaces is that the existence of a dominant group can lead to a "winner takes all" situation, with the group being empowered. Sumeet Gulati observed that, on the other hand, resource concentration should also make it easier to establish property rights, and counter fugitive rents.

Edward Barbier noted that location is important in contextualizing resource concentration. The further away (geographically) a resource is from the (administrative) center, the greater the likelihood of it being given to private developers. An example of this is prior water rights established for U.S. pioneers expanding westward.

Bernardo Mueller continued the presentation with the authors' take on property rights. The presence of scarcity implies that it pays to establish property rights, and to optimally change open access regimes. Why certain seemingly obvious changes are not sometimes made may be explained by the existence of groups that are likely to be harmed, and that block property rights changes.

The Coase Theorem's response to the existence of such groups is that the potential gainers can compensate them, to result in a net positive gain for all involved. It is thus important to consider political institutions in their determination of property rights. Worldwide, most natural resources are, indeed, not closed. With high transactions costs, property rights tend to be less than well defined.

The literature tends to take property rights as exogenous in their impact on economic performance. Another strand endogenizes property rights. Institutional endowments (politics, commitment mechanisms, bureaucratic capabilities) may not actually be exogenous. Mueller noted that institutional endowments are different from governance mechanisms—the latter are choice variables for policy makers, and therefore not stable.

Mueller went on to highlight the Brazilian experience of large, and continuing, subsidies to the Amazon regions. Despite administrative corruption, programs of transferring monies to the Northeast and Amazon regions have always been reinstated by successive Brazilian governments. The Brazilian executive wields considerable power, and is known to routinely purchase its Congress's consent through patronage. Interestingly, this is an instance of how property rights are extended with low transactions costs, given the pervasiveness of the patronage system.

Michael Toman noted that this brought up the issue of national governance versus federalism in resource use, and asked if federalism deserved further treatment in the IPD volume.

Joseph Stiglitz cited instances of local resources being a cause for conflict. A local concentration of resources and other parts of the country staking claims to one region's resources explain the breakup and recentralization of power in Nigeria. Analogously, Russia has witnessed struggles with local authorities capturing regional resources and impacting the power balance relative to the center. In the case of Nigeria, the army outside of the resource-rich region was stronger than the army in the region. Thomas Sterner drew a parallel with Norway's unwillingness to share its resources with a more unified Europe. Robert Deacon cited Collier's work (1998, 2000) on the propensity for civil wars in resource rich countries.

Bernardo Mueller noted that it is important to go further than the assertion that democracy would lead to better resource use. Merely inserting dummy variables for capturing the differential impact of federalism in regressions explaining economic performance would not capture the specifities of different countries' circumstances. Edward Barbier noted that a better explanatory variable could be ethnocultural fragmentation, something that a "federalism" dummy would not necessarily capture.

Joseph Stiglitz expanded the theme of critical taxonomy in the discussion of property right changes, or lack thereof. When a Pareto-improving change is sought to be implemented, the very act of change reveals information that can be detrimental to parties that benefit from the current property rights structure. Alternately, there may be no way for a government to commit to not use such information. Change also reveals coalitions of interest groups. Thus, there are strong incentives to maintain the status quo. An instance, cited in Stiglitz's AER article came up when the CEA (Council of Economic Advisors) proposed improvement of water sites by enabling private developers to extract more hydro-electricity. The evident Pareto improvement would have been reduced resource cost, given that power providers would have received the same payments as they had received for energy generated through hydrocarbons. However, no one believed the government could commit to unchanged rates, or hide the information that hydro power producers would be effectively subsidized.

Jon Strand cited the instance of a Norwegian government proposal to give income transfers to reduce agricultural wastes that had ballooned in a context of subsidy-

supported agriculture. There was a stiff resistance to the proposal since such transfers would have revealed the extent to which farmers were being subsidized in the first place.

Robert Deacon summarized the discussion by saying property rights seem to be more valuable if no one knows they exist. Sumeet Gulati noted that information is indeed a type-revelatory mechanism, and that could explain Stiglitz's point of groups not wanting information to be made public. Thomas Sterner pointed to how a public construct of information could be used by groups to ensure a status quo—the public image of French farmers as unwilling to negotiate might seem irrational in that it encourages adverse opinion, but, by thwarting the likelihood of negotiation, the image of belligerence only furthers their cause.

Michael Toman cited the constructive way in which public revelation could be used in the context of Indonesian environmental policy. Industries were given color codes depending on their environmental impact. The color codes were not published for a year so companies could make improvements during that time. If the company improved its environmental standing, the better grade would be published.

Bernardo Mueller described the relatively recent institution of the offices of public prosecutors in Brazil. These are institutions with absolute independence, earmarked resources, high caliber human resources, and credible legal threats and are headed by individuals motivated to defend Brazilian society from predatory governments. They are more likely to pursue a government agency for not preventing or punishing an individual's behavior than prosecuting the offending person. Appointments to the office are through public examinations, and this increases transparency. An important caveat is the lack of checks on these prosecutors.

One aspect of the impact of political risk on resources is that a higher probability of losing claims to a resource hastens its depletion. On the other hand, political risk also causes resources that would have been developed to be left untapped, and could change the extraction profile towards postponed depletion. A UC San Diego study indicates how countries with "low-quality institutions" actually have lower rates of production of commercially-exploited resources.

Joe Stiglitz brought in the role of poorly functioning capital markets to the discussion. The "gifting" of a resource to the private sector (as in timber in Canada) enriches the capital base of these companies and is a form of government subsidy to production. This is in contrast to the view of older literature that focused on the presumed giving away of rents by the government. One issue the IPD volume might, therefore, want to address is the fact that countries with good institutions often established them with some arbitrariness. An example of this is the claims made by indigenous peoples in Canada to resource wealth that, under the current system, has been transferred with secure rights to private companies. International institutions often do not address the extent to which existing property right structures are legitimate in the first place.

Michael Toman drew attention to the empirical content of the discussion, namely that the geography of resource matters.

Robert Deacon viewed property rights as public goods that can be subject to concentration in contexts where there are special interest groups. The public good in that case is not developed or made available, or, as Joseph Stiglitz added, subjected to efficient exploitation over appropriate time horizon.

On the issue of optimal resource extraction rates, Edward Barbier noted that biological regeneration of forests required resource exploitation rates that were not aligned to private companies' horizons, and that explained why a policy like enabling longer leases to a forestry companies to enhance conservation have not been successful. The participants noted that property rights by themselves (as in the case of changing lease periods) are not sufficient for good resource management. Regulatory requirements also play an important role.

Robert Deacon commented on the idea of "resource curse" and how resource abundance seems to cause slow growth and poverty. The common explanations of Dutch disease or distraction (i.e. the population doesn't pursue an education because of the abundance of ready wealth) do not hold up in countries with good institutions. Problems seem to especially plague those countries where the resource is geographically concentrated. Point resources tend to give rise to political instability but those resources easily controlled by a centralized government tend to engender a centralized government. The situation gives rise to a system of governance where only a few people make policy because they have all the wealth. He questioned if there were any links between resource abundance and economic growth without governance institutions.

The presentation concluded with the authors identifying the need for better measures, improved modeling and for unbundling institutional aspects like instability and corruption that tend to be grouped together.

1.3 Measuring development prospects by 'greening' national accounts

Kirk Hamilton's presentation addressed the question of whether practitioners have the right numbers in dealing with issues of the environment and resource dependence. The focus was on how to use asset accounts to measure prospects for development, and, at the level of empirical testing, whether adjusted measures of saving actually perform well.

Joseph Stiglitz noted that, while Net National Product is of relevance in discussions of whether profits originating from resource wealth leave the country of their origin, the professional opinion had shifted in the past twelve years to using Gross Domestic Product. This makes for an obvious caveat in interpreting GDP figures when the primary concern is the welfare of a resource dependent country's citizens.

Kirk Hamilton noted that the demerits of using GDP as a measure of welfare have been documented, including in the works of Nordhaus (1978) and Eisner (1986).

The aim of the current exercise is to develop a measure of "genuine saving" that accounts for depletion and sustainability. The measure deemed appropriate is the change in the present value of utility, or marginal utility of consumption, an idea emerging in Dasgupta and Mäler (2000), and Asheim and Weitzman (2002) have developed the theory of such assessment.

Sustainability in this context is interpreted as non-decreasing utility over generations, while negative genuine savings indicate that welfare will decline at some stage. Correspondingly, sufficient portions of the rent recovered from resource extraction need to be reinvested in other forms of capital to compensate the present and future generations for the depletion of their natural capital.

In the real world, however, there are issues such as thresholds to be dealt with—it is not as if there are smooth marginal damage functions, so that there may be variables with absolute cutoffs beyond which welfare deterioration is substantial and not merely incremental. In such a case, biophysical measures of the impact of environmentally significant activities have to be relied upon. Similarly, a clear assessment is needed of the substitution possibilities between assets that are produced and natural assets in a country's portfolio. When a computation of "genuine saving" was done for Indonesia (WRI, 1989), the effective growth rate was estimated to be as much as 4 percentage points lower than that implied by conventional calculations.

The World Bank (2003) has attempted calculations of genuine savings measures that add investment in education (representing human capital formation) to gross savings and subtract depreciation, energy depletion, mineral depletion, net forest depletion and carbon dioxide damage. Participants debated the validity of these components. Admittedly, the estimates involved are quite approximate.

Alan Krupnick argued that the use of carbon dioxide (and no other pollutant) did not seem appropriate. Joseph Stiglitz noted that it made sense to include the impact domestic pollutants into the calculations, while it could be argued that the impact of carbon dioxide tends to be much more worldwide.

Measuring mineral depletion is not straightforward. Stiglitz observed that the Commerce Department used to adjust oil depletion by discovery of oil to arrive at an estimate of net depletion. This is inappropriate since the supply of oil, including undiscovered oil, is not infinite. As Kirk Hamilton noted, the marginal cost of new discoveries increases over time, with later deposits being more difficult to find. New discoveries should therefore be valued at their marginal costs. The depletion figures used in the World Bank (2003) estimates do not include rents in resource extraction. Further, in standard practice, national income accounts do include exploration as an item of investment.

Alan Krupnick brought up the fact that the measure excluded life expectancy or health measures that are sensitive to environmental conditions. PM10 concentrations, for instance impact healthfulness substantially. To the extent that a change in life expectancy

(possibly seen as a net effect on human capital) can be viewed as a reduced form for what happens in a country, it might be useful to capture this effect in a measure of genuine saving.

In the World Bank estimates presented, negative genuine saving rates were observed for some countries. Ramon Lopez noted that in all estimates of saving, a correction should be made for per capita wealth accumulation. Saving is to reflect allowances for the maintenance of future generations' utility, so that the change in wealth per capita potentially involves sharing wealth over a larger population. For countries with population growth greater than 1.5%, accumulation may effectively be negative.

The paper presented also looked at the experience of three South African countries, concluding that Botswana, while the most resource dependent, also witnessed wealth accumulation at the greatest rate.

The genuine savings measure has been empirically tested to indicate whether a dollar of genuine savings indeed translates into a dollar change in consumption. For shorter time frames, the conclusion was that there was no relation for developed countries, while for developing countries, a one-to-one relation was indeed found. For developed countries, it could be argued that the impact of research and development and other factors, which have a consumption-enhancing role, are excluded from the measure in Hamilton and Hassan's paper.

Hamilton noted that at a policy level, adjusting GDP by measures of genuine saving point to the fact that current economic performance need not necessarily be informative about sustainability. While gross savings is an important macro measure, net savings calculated in ways consistent with green accounting can indicate if a country is investing enough in human capital, pollution abatement and resource management.

The discussion turned to why, despite the focus on green accounting in the early 1990s, implementation has not been forthcoming. Botswana's nationally mandated use of green accounting stands as an exception. The participants noted an aversion to switch from the conventional GDP measure. Stiglitz noted that adjusting the levels of an income series is in itself not instructive. Countries are prone to take notice only when changes in their asset levels are brought out.

Michael Toman raised the question of whether genuine savings calculations can enable a robust indicator. At one level, environmentalists would, possibly, rather favor biophysical measures that can enable heuristic examples of resource degradation in impacting the popular debate.

The view emerged that squandered resource rents are an important reason for being concerned about greening national accounts. Thus making genuine savings calculations would be especially important for oil and other resource depleting countries.

Joe Stiglitz felt that such calculations are especially important in periods when a country's pace of development changes, as they can enhance the ability to evaluate claims of a country becoming wealthier through understanding if the welfare of current and future generations has been compromised in the course of suboptimal genuine savings. It is a compelling argument against cheap privatization and extraction. This has the potential to inform political debates, and it might be worth drawing attention through a paper on the subject that also addresses how different accounting frameworks can change the view of the direction and impact of development.

2. ENVIRONMENT'S INTERLINKAGES WITH TRADE, STRUCTURAL ADJUSTMENT, MACRO POLICIES AND INSTITUTIONS

2.1 Trade and Environment

Brian Copeland and Sumeet Gulati addressed the interplay of international trade and environmental quality, with the focus being on composition, scale and technique. Comparative advantage underpins competition in trade. Greater openness makes some countries with a comparative advantage in environmentally intensive goods increase their production of those good. This does not automatically point to policy distortions.

Studies that analyze the static effects of pollution on reducing welfare often make an implicit assumption of there being no negative production externalities. Studies linking increased openness in trade to more pollution often assume no negative impact on income. Income increases might, however, have an impact on reducing pollution at a later stage of development. Again, depleted natural capital may lead to lower income-producing capacity and result in a 'lose-lose' situation of lower incomes as well as less stringent environmental regulatory mechanisms.

Another question raised was whether there should be a link between trade policy and environmental issues, and whether lowering trade barriers increases the incentive for environmental regulation and better property rights. Other issues are the validity of trade agreements that incorporate environmental policy reform, and the question of sequencing, i.e., whether environmental policy reform should precede or follow trade reform.

Sumeet Gulati mentioned two types of studies of whether income effects operate to improve environmental quality over time. Cross country studies relate pollution indicators to income per capita over time, but do not yield robust results, on account of a possible lack of a stable relation between pollution and income. Micro level studies address the issue more directly. The authors drew attention to the World Value Survey, a rich source of micro-level data. The consensus here is of an income effect existing, and research questions of the impact of opening up trade to pollution and natural capital depletion follow.

Joseph Stiglitz commented that the question of concern is not the trade-growth-environment linkage per se, but whether there are trade policies that are more likely to

have adverse effects on the environment. In contexts where trade is a euphemism for international companies to exploit the environment, the deleterious impact of opening up comes into play.

Brian Copeland averred that for poor countries, the question of whether there is an optimal scale of trade consistent with environmental protection is not as much a concern, since these countries do wish to grow, including through trade. Composition effects (changes in shares of environmentally sensitive goods) are thus more important.

Sumeet Gulati continued with the paper's view on how property rights are important for natural resource regulation, but these often do not respect jurisdictional boundaries. One way to model the trade-environment interactions is to view property rights as inflexible (as in Chichilinsky(1994)).The view predicts that in an open access economy, opening up to trade would, in the long run, cause natural stock depletion.

Jon Strand noted two channels linking trade and property rights. One is that trade in a resource, by increasing its value, should enhance the establishment of secure property rights. The second is that, in frameworks of endogenous property rights (Hotte et al.), we can think of private costs to enforcing property rights. Trade by increasing prices of a resource intensive good serves to encourage enforcing property rights.

Ramon Lopez felt the analysis of the supply of property rights raises the question of what makes for stronger social institutions or governments that enable these rights. Michael Toman saw a case for differentiating between open access resources that stay as such, and those that become valuable when they are tradable, but are also controlled by an elite.

Joseph Stiglitz distinguished between international trade and foreign ownership. In the case of oil in Mexico, there is no doubt that Mexico will trade in the commodity. Of greater concern is the fact that foreign ownership can have interests conflicting with national interests, especially if property rights cannot be ensured and resource stripping cannot be prevented. Domestic control, even if in the hands of an elite coterie, may have a greater concern for a less myopic resource extraction pattern.

Brian Copeland raised the issue of whether foreign-owned companies tend to be more or less pollution intensive. Stiglitz weighed this with the observation that foreign-owned companies are more likely to be under greater pressure to maintain lower levels of pollution. On the other hand, domestic companies are under more pressure from the public and have to follow certain implicit regulations. Sumeet Gulati noted that the present paper did not consider differences between domestic and foreign ownership on environmental impact.

Stiglitz observed that the market does not account for all externalities, and ex ante regulation is usually difficult. The fact of greater production of a good with trade is by itself not the key issue, since more production is very much a part of the growth process. The question is how more production for a foreign market differs from more production for a domestic market.

Alan Krupnik noted that what is produced, the extent of sensitivity to issues like child labor, and cultural norms are criteria that differentiate production under trade from production for home markets.

Brian Copeland outlined two ways in which trade could have a negative impact. One is through promoting a race to the bottom, namely a weakening of environmental standards due to competitive pressures. The second is that by impacting comparative advantage, and by changing the distribution of pollution incidence, trade might shift pollution systematically to regions with poorer environmental standards.

Thomas Sterner added that trade does have a distinct scale effect. An increase in demand due to integration with the world economy can lead a small country with a comparative advantage to extinguish its exportable natural resource if its exports meet a small fraction of world demand.

Ramon Lopez noted the peculiarity of the notion of a 'race to the bottom' being only applied to greater laxity in environmental regulations due to competitive pressures. There is a case for comparing countries that 'give away' natural resources through subsidies or non-taxation in extending the idea of a race to the bottom. Joseph Stiglitz felt one reason compounding the failure of resources gifted away is that governments faced with budgetary constraints do not explicitly view resources as being given away because they do not account for them in the first place.

The composition effect of trade is a key departure point for how trade could differ from other forms of growth in impacting the environment. Copeland differentiated the pollution haven effect from the pollution haven hypothesis. The former is empirically less complicated to verify, and relates to the comparative static exercise of whether changes in the stringency of environmental policy change the fraction of pollution intensive goods in a country's net exports. The stronger hypothesis is that trade can systematically lead to a shift in incidence of pollution to countries with weaker environmental regulation

Ramon Lopez noted that the outcome was largely determined by whether the resource endowment effect outweighed weak institutional structures to cause resource depletion. Conventional estimates of comparative advantage do not necessarily indicate which effect will dominate.

Brian Copeland referred to the problems of empirically testing for pollution haven effects. Capital abundance and pollution intensity interact in determining the impact of stricter environmental legislation. It might well be that more stringent laws lead to a relative rise in composition of pollution intensive exports from a richer country, but this would, in such a case, only reflect the fact that these exports are also relatively capital abundant.

US studies have had the richest data and have been able to control for the stringency of environmental regulations at state and county levels. The key endogeneity issue is that while plant locations (or, in the international context, pollution intensity of trade flows) are driven by environmental regulations, pollution policy also responds to the very factors, including competitiveness, that it explains. The conclusion in the US context, when controlling for endogeneity bias, confirmed the hypothesis that hazardous wastes would have a net flow to states with weaker environment laws.

Kirk Hamilton advised care on extending results relevant to the U.S. to other countries. Wage differentials between American states tend to be lower than they are across countries, and that may be an important factor in cross-country differences in pollution intensity.

Copeland indicated that the expected composition effect for natural capital-intensive exporters and for pollution intensive manufacturers varies according to whether they have weak or strong property rights. Countries with weak property rights are likely to be less able to protect their resources. Among these countries, the pollution intensive exporters are at least in a position to recover from their predicament, an option unavailable to countries that overexploit their natural stock.

In cross-country studies of the pollution haven hypothesis (as against the effect), trade has been found to affect countries differently – indeed there is no reason to expect systematic patterns. Sulfur dioxide intensive industries, for instance, are shown to shift to bigger countries that have a comparative advantage in them.

In policy terms, Copeland differentiated between internal and external policy. Contrary to the theoretical case for distinct environmental and trade policy, most countries do not internalize environmental distortions. It is not always feasible to direct environmental policy at environmentally intensive industries that are likely to gain from trade. Thus a case for careful sequencing needs to be made. Instruments matter in that rigidities in implementation make for taxes and pollution standards having non-equivalent impacts.

On the external policy front, imposing environmental harmonization is not usually optimal, given varying local marginal damages and marginal abatement costs. With international regional unions, however, there may be a case for harmonization increasing welfare. One reason is that rent seeking industries which would gain from relocation between countries of the regional union are undercut by environmental harmonization, so that there is less scope for distortionary plant location.

Jon Strand noted that there are efforts by developing countries, especially those with industries supplying to developed country firms, to comply with regulations like ISO4200. Brian Copeland noted that product and process standards are differential in their environmental impact. Targeting standards in the case of products can, in some cases, increase benefits to developing countries, while the WTO disallows extra territorial market access contingent on process standards.

2.2 Structural adjustment, natural/environment resources and well being in LDCs

Ramon Lopez's presentation focused on the macroeconomic obstacles impacting the environment. These include macro instability, static distortions, the dynamic underproduction of public goods, and political economy constraints on public good provision.

Static distortions, such as mandated firm ownership structures and price distortions can have a dynamic impact on efficiency and growth. On the side of dynamics, Underprovison of education, environmental protection and strong institutions all feed into factors that, in the sense of the Solow "curse" of neoclassical growth, make for a lack of increased productivity. In the 1990s, the static distortions were assumed to have been substantially reduced with most countries eliminating domestic price controls. Concerns about underinvestment in public goods, however, remain. Lopez opined that while structural adjustment programs (SAPs) have worked to reduce static distortions, this could be at the cost of worsening public good undersupply.

Jon Strand inquired if the country analyses to be made in this context were more relevant if comparisons of countries' current state were made with periods prior to structural adjustment programs (SAPs), or with counterfactual scenarios of no SAPs having occurred.

Lopez observed that underinvestment in public goods is important because it slows growth, and makes growth less socially equitable. The potential for concentration of physical capital in a subsection of society is almost unlimited. With human and natural capital, however, the tendency is for decreasing returns at the individual level (contrasted with increasing returns to society as such). Studies show that the Gini coefficient of inequality in education declines over time, indicating reduced inequality. Correspondingly, undersupply of human and natural capital would compound social inequity.

Environment is critical from the social equity standpoint since most of the poor are impacted by it, and most of the damage to environment is borne by them. Investing in human capital has the potential to transfer employment to cleaner sectors. Sumeet Gulati cited the instance of tropical Asian countries, and Ed Barbier referred to Gilferson's analysis of the correlation between resource dependency and reduction in human capital. Increased resource dependence feeds back into lower investment in human capital in a situation of an increased premium to the present.

Answering Brian Copeland's question on how "clean" an industry manufacturing would be if it were the alternative to primary sector dependence, Lopez clarified that he referred to the potential of high knowledge and technology intensive sectors.

The argument for better institutions must also be accompanied by a call for more financial and human resources for the institutions. Even the right environmental rules are not easy to enforce.

Lopez referred to recent surveys (Psacharapoulos, 2002) indicating high rates of return to education across the world. Alston et al (2000) surveyed some 200 studies to conclude that the average social rate of return on agricultural research was over 50%, with no evidence of a decline in returns over time. The World Bank (2000) estimated benefits of pollution abatement of more than 100% in present value terms. Given these rates of return, the underinvestment in environmental and human assets is of concern, as is wasted investment such as subsidies to agriculture without adequate infrastructure. The contrast to perverse subsidies of as much as 25-30% of government expenditure is stark.

This brings about the question of why public goods are underprovided. First, the government wastes public resources in unproductive subsidies and other dubious investments. This crowds out investments in public goods. There is also a failure to charge for public patrimonies given freely to powerful economic groups.

The structural adjustments of the past have had a narrow focus. Fiscal adjustments further reduce the supply of public goods and cause dynamic distortions to deepen. There are cuts in social spending, including environmental monitoring and controls, while subsidies are largely left intact.

Moreover elites force decisions of the state. Lopez cited Robert Deacon's estimates of a 30-40% difference between full democracies and dictatorships in variables like access to safe water and sanitation.

Capital market spillovers to political markets—for instance the ability of the rich to bribe the establishment—have been largely ignored by economists in their focus on price distortions, on account of the difficulty in modeling them.

Hamilton noted that the World Bank now accepts that its past actions of advocating certain expenditure reduction measures were wrong. It is now more focused on public sector reform. Of course massive macroeconomic instability was not viable either

Lopez countered that the World Bank missed an important opportunity to fix short-term problems with policies that would lead to long-term good. It is not possible to go back and rebuild the programs that were cut.

Barbier summarized some of Lopez's points: prior to SAPs, two sources of distortions, static and macro level (exchange rates and the like) were known to exist. One implication of Lopez's analysis is that with vested interests not having declined, rents to the elite in countries might be coming from elsewhere—in particular, from control of natural resources. Barbier was concerned that by lumping together public and environmental investment, there was a risk of the World Bank being contented with having attained the objective of increasing investment in public goods. The subsidizing of elites could, however, be continuing in some form.

Lopez elaborated that some prescriptions, like an emphasis on education, are empty without the advice to cut certain subsidies or tax certain resources. IMF targets to countries are often straitjacketed.

Michael Toman referred to pre-2000 adjustments cited on page 13 of Lopez's paper, and suggested that references to empirical instances of reduced public budgets could be increased. Lopez noted that, while data was available, it had seemed better to provide a broad framework in the paper, rather than look at how each component of public expenditure had been affected.

A key point he wished to convey is that while distortions under SAPs of the 1970s and 80s have been ameliorated, we are far behind in addressing environmental degradation. The indirect effects on the environment, in terms of lack of adequate expenditures on its management, are perhaps more important than the direct environmental effect of policies. As regards the empirics, it is difficult to isolate effects—so that if the effect of a policy is positive to the environment but negative on human capital, the net effect is difficult to compute.

Mueller extended a point Lopez had made about land reforms in Brazil. As a social investment, land reforms, he felt, were a poor policy since they did not ensure land was secured for small landowners. The land reform lobby is strong, and land reform is popular with the Brazilian electorate. Yet the reality is of small landowners becoming bankrupt and being forced to sell their land. When land redistribution is implemented, the political focus—suiting both the lobby and the government—is on how many peasants were given land, and not on how many retained it.

Noman brought out another dimension. Even if a country had 4-5% more GDP than it currently had, it is very hard to spend more on agricultural research and education. There are often capacity constraints, such as the availability of teachers for secondary education. Similarly, in the African context, it is not easy to switch resources towards research and extension. Lopez however felt that a beginning is necessary, and, importantly, this should not be wasteful. An example of a squandered opportunity is of how, of 21 agricultural research and experimental stations begun in one program in Peru, 20 became commercial farms – in effect what was to be an investment was extinguished.

Noman, noting the influence of the literature on policy, said that IMF conditionalities have indeed changed over time. But the basic environmental concerns have not changed, and neither has the fact that reforms that reduce (explicit) subsidies avoid targeting the rents that the rich make off resources.

Lopez rounded off his presentation with the concern that macroeconomic advice without cutting down on wasteful expenditure could have the accompanying cost of higher debt. In addressing environmental issues, the lack of human resources, which is an important complementary resource, must not be ignored, since capacities to monitor and preserve the environment are not always present.

2.3 Impacts of macroeconomic policies on the environment, natural resources and welfare in developing countries

Jon Strand concentrated on macro issues such as taxation and sectoral subsidies, capital market openness and policies directed at domestic financial markets, and how the environment and resources respond to these factors. He was concerned about the overlaps between his paper and others, and some of these were addressed in the discussion.

There is little direct evidence as to what happens to environmental resources when there are fluctuations at the macroeconomic level, and in response to policies geared at countering fluctuations. This issue is not specifically covered in the other papers.

Taxation and subsidies that affect the environment, Strand noted, have both macro and micro dimensions. Their use by governments as fiscal mechanisms, and their role in the government budget imply an impact on stability and on resource use. Each fiscal scheme, however, has a micro-level purpose and impact.

At a global level, subsidies in the non-OECD countries are about 6.3% of GDP (2001, Beers and Moor), with the energy sector receiving the largest chunk of subsidies, some 5.5% of GNP. Estimated relative efficiency gains of reduced subsidies were on average, 0.7%, while average relative carbon dioxide reduction would be 16%.

Copeland enquired if the efficiency gains were computed as the reduction in deadweight loss, and, in particular, included reduction in energy subsidies to the industrial sector. Strand answered that the figures accounted for subsidies aimed specifically at energy consumption, including consumption by firms, but was not sure if deadweight losses were taken into account.

Toman clarified that the IEA (International Energy Association) data calculated efficiency gains as reductions in direct deadweight losses and this would not include potential gains from provision of other public goods with the resources released by removing energy subsidies. Arguably, these gains would be important in an economy already starved of public goods.

Sterner pointed to an interesting association of the politics of Latin American regimes and the prices of kerosene and gasoline targeted at the constituencies of the rural and the urban poor. On the issue of political rewards to group, there is often a popular pressure in countries that produce their own petroleum to provide cheap gasoline.

Toman suggested that some of the discussion on government expenditure could be dealt with in Lopez's paper, while aspects like the exchange rate and interest rate policy, outlined on pages 16 through 19 of the paper, fit more naturally into Strand's macroeconomic focus.

There have been work correlating devaluations with resource extraction. A devaluation implies a country will find it more advantageous to export. Pandey and Wheeler (2001)

found that extraction rates increased by some 2%, while others have found an increase in deforestation. The link, though, is not theoretically obvious. An increase in the price of a forest in the longer run could lead to the establishment of property rights, reducing pressure on forests in the shorter run.

While the theoretical link between higher interest rates and resource extraction profiles is clear, this is not so empirically. Sumeet Gulati asked if the relation between interest rates and resource extraction could not go the other way—i.e. greater resource extraction in the present providing high returns in the resource sector and (presumably through bidding away capital) higher interest rates. Strand noted that monetary policy treats interest rates as a policy variable, and Lopez added that the relation between two endogenous variables tends to be unstable. Interest rates could increase on either count - monetary tightening or better opportunities for investment.

Strand's next focus was on government policies with implications for the environment and resource extraction. Kaminsky's analysis of co-movements of yields in different markets is indicative of the degree to which a very open economy can be exposed to shocks. Bond markets, usually subject to a higher level of international trading, show the highest correlation with foreign influences, while domestic credit markets have the lowest correlation. Exchange markets fall in between in the extent of their co-movements. In terms of impact on resource extraction, the interest rate is likely to have the highest impact, but also tends to be well shielded for most economies. Short run responses might not follow the general rule.

Krupnick raised the point that policies that target the revenues of polluting industries may or may not involving earmarking, so that their macro impact would be different. The analogy for the United States is taxes on chemical industries that are channeled into Superfund cleanup activities, or gasoline taxes channeled to maintaining roads. Sterner clarified that in most countries, environmental taxes are indeed earmarked towards environmental protection.

Strand resumed his presentation with a discussion of short-run political stresses and factors that might lead to contraction in output due, in part, to openness in international markets. The direction of potential impact on the environment may be to cause less pollution, or, on the other hand, to quicken resource extraction where possible to make up for lost export revenues.

On this point, Toman observed that governments do not really hold resources as a stock to provide a buffer in recession. Strand noted how a recession could serve to reduce pollution and deforestation, but might also lead to greater extraction of fuel wood and other resources by the poor who facing an erosion of their living standards. Barbier pointed to his simulation of Thai shrimp farming and the response to an Asian-crisis-style shock, which was found to be environmentally detrimental. Sterner pointed to the interesting finding that Mexican gasoline prices were cyclical, while taxes were countercyclical, indicative of political and populist calculations in exercising policy.

Strand sought to know if other task force papers would cover financial market issues as there was an overlap with some of the issues he was taking up. Toman responded that there were complementary perspectives in some topics such as public goods, with a macro and a micro take on the subject which could be accommodated in different papers. Issues of structural adjustment were being tackled in Lopez's paper. For a topic like foreign direct investment, Copeland and Gulati's paper would deal with the issue, but would not focus on questions of volatility, which Strand's paper would cover.

The relation between financial market variables (and the presence or absence of regulations like exchange pages) and resource extraction was touched upon. Toman pointed to how, in the context of developing countries, it was difficult to build hedges against volatility, including income risk at the macro level. Sterner brought up the case of Mexico, where, even as the country was coping with structural adjustment, the discovery of oil in effect meant a source of almost limitless credit.

On the issue of empirical examples, the participants shared their knowledge of studies of welfare consequences of policies. A study on the water sector in Central America examined the welfare effects for households of access to tap water. One method used was to estimate the demand for household water, and, in line with consumer surplus calculation, integrate the demand function. A second method was to use hedonic prices from a survey that collected detailed data, including size of a house, value of the house and so on, and estimating the effect of having tap water. Given that some 62% of people did not have access to tap water, incorporating the value of having a water connection eliminated one-fourth of the difference in living standards between those with and without tap water connections.

Toman referred to Douglas Barnes' work, including case studies rich in empirical detail, though these were not systematized econometric studies. Lopez noted a dimension to the debt-environment debate that Strand's own work had looked into. For a country under macroeconomic stress, a benevolent outsider can exercise mechanisms to prevent the extinguishing of resources by rewarding the country for not extracting, or postponing extraction of its resource. Such mechanisms could include purchasing some of the country's outstanding debt in return for greater environmental restraint.

Lopez referred to the possibility of substitution among assets at the macro level. What asset a country draws down is a policy variable. A country's options in meeting deficits might be to draw down on financial assets, environmental assets, to privatize and so on. This is another context where green accounts can help to put into perspective the full impact of policies.

Hamilton drew attention to the need to incorporate work on environmental income (such as shares of world income derived from the environment in an extractive manner, as opposed to income from items grown for consumption or sale). He also referred to the need to take up the environment-health connection, given that a fifth of health conditions are estimated to be related to environmental factors including different types of pollution.

DAY 2 (OCTOBER 11, 2003)

Michael Toman began the second day's proceedings by noting that Ramon Lopez and he would send out a note to all authors, and a summary. There were a few other papers that needed to be reviewed for the volume. Since the discussions and proceedings of the workshop were serving the purpose of peer review, there would not be a separate peer review after the workshop.

2.4 Environmental policy instruments in developing countries

Thomas Sterner focused on instrument selection and design for environmental policy, and laid out criteria to evaluate instruments, namely efficiency, fairness, political feasibility, and the costs and information needs of the instrument. An instrument that is efficient but not fair or politically justified is unlikely to be implemented as envisioned. Economists' focus on efficiency can sometimes ignore this crucial aspect.

Toman noted that theory points to efficiency as a function of income. Sterner's criteria may suggest that if we attempt to reduce the degree of contention associated with an instrument, that might serve to increase efficiency.

On the issue of instruments, Sterner noted that explicit prohibitions on environmental usage are often inefficient. Taxes tend to be resisted so much that they end up very low even in contexts where it is not justified. The success of taxation can depend on how this resistance is countered. The policy of refunded emission payments in Sweden allows for taxes that are collected in proportion to NO_2 emissions to be refunded to producers according to their production of energy for heating. Since a company's tax depends on its emission, there is an absence of a united industry lobby opposing such a tax and refund structure. This, interestingly, implies that a much higher and appropriate tax can be set than under a system that applies a uniform tax to all firms.

Sterner cited an example of how apparent solutions to environmental problems could result in increased stress on the environment. Chinese fishing has recently jumped to some 15% of the world's catch from 3%. This might be in possible anticipation of international catch size regulations on China. By increasing its catch, China might be intending to set a high baseline for future extraction.

Policy instrument choice is based on several criteria—the heterogeneity of abatement costs, heterogeneity in damage and risk/uncertainty. Market based instruments or MBIs are important in the context. Property rights are fundamental in that taxes and permits are essentially assignments of property rights. Land ownership is not a simple right, since it may or may not include rights to resources under the ground, grazing, passage and the like. While economists' concern is often to set up an optimal trading scheme for permits and other instruments, it might be more important to set up the relevant property rights.

Edward Barbier asked if the setting up of property rights would include allowing third parties to trade instruments—for instance, should environmental groups be allowed to

purchase tradable permits. Sterner replied that there are usually restrictions on concentration of tradable permits with one party, and Krupnick added that the issue was that a third party could, by increasing the price of the permit (by restricting its supply) effectively lower the cap on the activity in question. Toman however noted that the practical significance of third parties being able to do so was not very large. A valid question however is of how rights to permits get allocated between parties, such as communities and commercial fisheries.

Sterner posed the question of whether a move away from regulation and towards MBIs, as has occurred in OECD countries, was appropriate for developing countries. MBIs do not circumvent the need for monitoring and are not self-enforcing. The merits of shifting to MBIs in situations where the legal structure and bankruptcy laws are not strong enough were not clear. Michael Toman linked the observation to the debate on command-and-control type versus market-based methods of protecting the environment. It is not as if command based systems are always inappropriate—a recent mandate by the Supreme Court of India to compel public transport in New Delhi to use compressed natural gas has been documented to improve air quality in an instance where a market-based instrument may not have succeeded.

Stiglitz observed that some instruments are easier to monitor, a point that Barbier took up to suggest an examination of conditions under which command and control systems would and would not be effective in environmental policy. Sterner's book discusses that topic, and he felt that MBIs were not necessarily the best instruments.

Barbier cautioned that we might be in the midst of a shift in fad from one to another type of policy, and presenting a chapter that balanced views on types of instruments would help put the debate in perspective.

Sterner observed that there are MBIs that work in developing countries, though they may not be designed exclusively to address environmental concerns. An example of this is fuel taxes. He presented the example of China where an environmental law existing since 1979 taxes industries at different rates, depending on their location. To Deacon's query of whether the taxes generated abatement, Sterner noted that even if the tax were essential a revenue raising mechanism rather than one for abatement, it could be important in creating property rights. Stiglitz added that one purpose of bringing on a new type of tax can be to call attention to certain variables and enable their monitoring – historically, the income tax in the United States was less of a revenue source to start with, and more of a pointer to enable monitoring and corporate governance.

Sterner clarified that in the present day context, monies from environmental taxes in developing countries do often go to targeted funds. These funds sometimes have boards of directors of polluting industries being involved to manage the use of revenues to address environmental concerns. The example of color codes for polluting Indonesian industries that had come up in discussing Deacon and Mueller's paper was revisited. Sterner also mentioned how Malaysia dealt with the waste disposal problem of its palm oil industry. The consequences of pollution in 1977-82 were so severe that villages were

forced to relocate. A simultaneous system of emission standards backed by taxes helped curtail emissions to much below what the growth path of a booming but environmentally unregulated palm oil industry would have seen. The tax in this case had two components —a per-unit rate applied to a threshold level of emissions, and a higher rate for all emissions in excess of that. While this is not as detailed as efficient taxes could be, it did address the problem at hand.

Sterner noted that the term "economic instrument" is a tricky one, and it might be more constructive to focus on policy design for developing countries which could deem more than one instrument appropriate. Developing countries face many issues, such as the provision of public goods, which OECD countries have previously solved successfully. The presence of a large population of poor people with labour and natural resources as their only assets suggests that efficiency criteria in managing these natural resources may not be uniformly beneficial. Ecosystem resources are an important share of the portfolio, and, though not necessarily large in monetary terms, are important in providing protein sources to supplement poor diets, and enabling livelihoods.

Stiglitz pointed to the distinction between the difficulty of monitoring environmentally significant behaviour and the task of enforcement in a context were there are several small firms, including many that are only marginally a part of the mainstream economy. He cited the case of Nepal, where the ecological concern of preventing deforestation was challenged by the impracticality of monitoring thousands of individual actions.

The relevance of community rights and enforcement in monitoring was discussed. Barbier recalled the Thai experience where mangroves, though owned by the government, have open access rights to local people. This was transformed by shrimp farming, and community based enforcement and monitoring became difficult to implement.

Sterner cited Ostrom's framework for sustainable property right schemes as useful in pointing to vacuums between private and local property right structures. Stiglitz highlighted the risk of elites within a community seizing property rights.

Jon Strand questioned whether there are sufficient institutional capacities. Ministries that are unaware of the full scope of environmental problems are all too common. Stiglitz added that the extent to which an environmental policy instrument is skilled-labor intensive can point to how successful it could be. Sterner agreed with this—clean fuel is easier to monitor than clean engines are, and the skilled-labour intensity of monitoring activities could make for a useful criterion for implementability.

Bernardo Mueller however pointed to how willingness is also important. Brazil had the structure for environmental protection long before the 1992 Rio conference. However, it is only more recently that a conscious application of technology like satellite mapping and efforts by independent public prosecutors property rights has addressed infringements of forest lands by commercial farming.

Strand noted how laws applying across ministries can have conflicting interests. Stiglitz connected this to the issue of approaches to legal enforcement. Legal structures in the US, for instance, evolved in a circumstance where there was a concern that the government would not enforce anti-trust laws. In the case of environment, where potential injury is large, the right of joint action is a mechanism for legal enforcement, as with public interest litigations in India. If there is a belief that government patronage can be bought, but the judiciary is independent, a system of checks and balances evolves.

Toman brought up a countervailing caveat that it is often easy to engender petty third party litigation, so that there is a need to have well defined norms or a mark against which citizens can litigate. Hamilton cited Colombia and Tanzania as instances where litigations had multiplied unchecked.

Responding to this, Stiglitz suggested an independent appraiser to assess the magnitude of damage before the system goes forward to bring suit on possible environmental offenders. The parallel he drew was to the legal innovation of the US criminal system, wherein a *prima facie* case of a minimal level of standard of proof is made before charges are tried.

Barbier countered that legal innovations are not likely to repair the problem of ill-defined property rights that the poor face. NGOs do take on the task of representation but need not always be successful. Privatization is often offered as a solution to property rights problems, and one that is not costly for governments.

Sterner brought up the issues of adverse selection and moral hazard in their impact on the environment. The poor are especially risk averse, and in the absence of access to banking systems and markets for savings, rely on other forms of wealth, such as cattle. Drawing a link to imperfect capital markets, he noted how overgrazing could be a manifestation of the lack of saving opportunities. Analogously, issues taken up in efforts to increase agricultural productivity might well have a different solution. As an instance, FAO expenditures on spraying pesticides to counter the desert locust problem have been found to be costlier than the expected harvest loss in the absence of pesticide. This clearly is a case for problem to be addressed by a capital market innovation, namely agricultural insurance, rather than through an environmentally significant action. Hamilton cited recent crop insurance schemes in the Indian context.

The discussion emphasized how different environmental problems make for customized mixes of policy instruments. He cited Somanathan's work in the case of water systems where tradable water rights are an appropriate solution that water users' associations can monitor and enforce. Public health and indoor pollution issues may call for more systemic solutions including public education and better stoves.

Hamilton noted how in an area like sanitation, coverage is important. The spillovers of poor sanitation imply that the health gains to a household from having a latrine are linked to other households in the community also having access to good sanitation.

Sterner noted how different instruments can address a problem at different levels. Industrial pollution by large industries, including MNCs is more subject to regulations like labeling and public scrutiny through journalistic efforts. To address pollution by small industries, on the other hand, an appeal to common property rights might be made. In countries like India, small manufacturing units are often concentrated in industrial estates. The common interest of maintaining a good reputation, the existence of MNCs, which might lend knowledge and inputs for abatement, and a common benefit from avoiding excessive enforcement, can all lead to solutions and internal rules. Administrative effort is also reduced, since a regulator only needs to monitor emissions/ wastes from an estate as a whole, rather than several small industrial units.

As a general point, the evolution of property rights is not a linear process, and local communities evolve systems addressing common interests. The periodic community-based reallocation of agricultural lands in Africa was a mechanism by which the interest of families that had grown large without adequate land could be secured.

Lopez pointed to how external enforcement can make for dichotomous environmental regulation systems. In Latin America, fruit exported to the US is to be produced in accordance with more stringent pesticide norms, while those for local consumption may be subject to a much more lax standard, with corresponding impacts that are detrimental to the local environment.

Stiglitz made a summarizing point about the social enforcement of communal-based property rights. Policies and the development process clearly can influence the ability to enforce collective property rights. Cases where individual property rights are not clearly defined are also cases where there is a risk of destroying the ability to have collective enforcement before the ability to ensure private enforcement. The intervening period is important in that it could also be when considerable environmental degradation occurs. Stiglitz cited the case of Mongolia, and Sterner referred to the Tanzanian island of Mafia. The latter had a localized system of property rights of access to water holes, fishing sites and so on, specific to the island's ecology and consistent with the inhabitants' conception of the value of different land features. Villagers, in transferring title to hotel developers, did not realize that this entailed a loss of their traditional rights. Applying a single concept of property rights is evidently not always appropriate in understanding the impact of changes.

3. SPECIFIC ISSUES IN ENVIRONMENT – WATER RESOURCES, FORESTS, ENERGY, AIR QUALITY

3.1 Water resource management

R Maria Saleth's presentation brought out the institutional linkages in the water sector. The focus was on why institutional reforms do not occur even when the opportunity costs of change exceed the transactions costs of inducing a change. As the other presentations

had made clear, the manner of sequencing reforms based on a better understanding of political economy constraints could be a critical factor in ensuring their success.

Institutions can be thought of as rule configurations, subjective in their origin, but objective in their manifestation, characterized by considerable path dependency and relative stability and durability. An implication of the path dependent and hierarchical nature of institutions is that they have a life of their own, which may not be easy to transform. The linkages between institutions are important. Water rights systems precede water markets, and steps to establish water markets would need to account for the existing rights system specific to a region.

Saleth presented an institutional decomposition and analysis (IDA) framework for analyzing water markets. The first stage of the framework distinguishes between the environment exogenous to water institutions, and internal structures that are endogenous. The second level of enquiry involves parsing water system institutions—law, policy and organizations. The final step is to analyze institutional aspects within water institutional structures, and between water institutions and the environment. Saleth went on to detail components of law (rights structures, conflict resolution, accountability and intergovernmental features), policy (project selection, cost recovery, water transfers) and administration (government structure, financing, fee collection, accountability). He traced the interaction of these components within water institutions and with the environment, including the political system and economic development, which together determine the performance of the water sector.

Policy reform and technology are aspects that can significantly impact water institution reform. An instance Saleth cited was South Africa, where the stimulus to reforming water institutions came from a more wide-ranging political reform in the country.

The key contribution of the economic take on institutions (as in North, 1990) is the incorporation of opportunity costs (including those of maintaining a status quo) and the transaction costs of changing institutions. The nature of these costs can be dynamic. Changes, whether on account of broader political developments, endogenous or exogenous factors, alter relative costs to water institutions. Extreme events like droughts increase costs to user groups. Macroeconomic crises might witness the absolute cost of inaction unchanged, but could inflate opportunity costs greatly.

Saleth then took up evidences of institutional linkages. Scale economies could come about due to countrywide economic and political changes that provide the stimulus to water reform. The existence of arrangements such as water banks in Australia and California can make implementing reforms such as reducing water withdrawals easier, since instruments can ride on pre-existing structures.

Prioritization and sequencing emerge as important in the institutional perspective. As an instance, the establishment of a prize for conservation efforts can be an initial stimulus, and levels of abatement/ mandated conservation can be increased over time. Similarly, it makes sense for urban water reform to be sequenced before rural irrigation reform.

Timing water institution reforms involves finding the best opportunity for implementing change. Macroeconomic or political flux and cycles including natural drought cycles can be pivotal events for such change. Saleth noted how the pace and scale of reform is crucial—quickly introduced changes can be useful in preventing an opposition to reform, while gradual changes can allow for building a support for change.

Saleth referred to two case studies. The first is that of Indian water systems, where there is considerable friction between the central and state governments on linkages of rivers and the attendant sharing of water. While the National Water Development Agency undertook feasibility studies, it has been necessary for courts to step in and, via their judicial independence, enforce reforms. Regarding conduciveness to change, an improved macroeconomic situation, budgetary cuts to the water sector and economy wide reforms served to reduce the relative transactions costs of changes.

Mexico's reforms after the late 1980s had a context in the macroeconomic crisis and changes in political structure. An interesting point is that decentralization may require a dose of centralization, as evidenced by the lead role that Mexico's CAN (the apex body developing and managing water resources) has in transferring irrigation management to the local level, and privatizing and localizing urban water services.

At the level of policy, the institutional approach calls for quantifying political risks through such tools as perception surveys. The examination of such risks in studies does not necessarily take away from methodological rigor.

Saleth gave a brief overview of his and Ariel Dinar's effort at quantitative modeling of institutional factors in cross-country evaluation of the water sector. Alan Krupnick noted that it would be helpful if some of these quantitative insights, including those from simultaneous equation models were incorporated in the analysis. Strand too agreed that more quantitative examples would be useful. Hamilton noted that a presentation of stylized facts of the water sector, comparable to those presented by Barbier, would help contextualize the paper.

Saleth voiced a concern that an analysis of more quantitive aspects of the issue, while available, might be relatively technical for the intended reader of the volume.

Michael Toman provided feedback on the structuring of the chapter on water institutions. He felt it would be useful to start by laying out what the problem of the sector is, why there are millennium development goals and some possible existing examples of places that have done well or have not done well enough in their water sector. This would lead onto the analysis of transaction costs relevant to the sector and the normative aspects of institutional building, accounting for existing structures and prioritizing reform. Participants felt that the chapter could also present some relative values, if these have been quantified, to indicate the volume and nature of transaction costs. These could further animate the authors' framework and quantitative modeling for the audience.

Strand observed that popular participation in institutions and user groups might not necessarily ensure welfare enhancing outcomes. Voting over a particular scheme in a water institution may have a contrary outcome for those without access to water if those with access constitute the majority.

Toman followed up with a comment on how the development experience has encountered the issue of scale economies in change implementation. East Europe, for instance, has had to decide between 'big bangs' and incremental small ones in changing the path of development. This is a critical point for the papers at hand, and should be concretized.

Krupnick noted that another issue worth discussing was the midway solution, namely the pilot approach, and whether it works or does not. Saleth pointed that large-scale reforms have indeed begun at a smaller scale, as in the case of Mexico's water reforms having been piloted in a few districts before being scaled up.

3.2 Forest resources, land use and biodiversity

Erwin Bulte could not be present at the workshop. His paper titled 'Conservation of Tropical Forests: Addressing Market Failure" was made available for the participants' comments.

3.3 Urban air quality

Alan Krupnick's presentation dealt with urban air pollution, concomitant health impacts, and policy instruments in addressing pollution. He presented data on urban population growth, share of urban population in total population, and share of health expenditure as a proportion of income for developing countries divided into four income groups. To place the problem in perspective, urban populations for high and upper middle income developing countries had increased to 78% by 2001. Health expenditures rose to some 4.2% of GDP by 2000 from 3.5% in 1990 for low income countries including India. The middle income group, dominated by China, saw growths rise to 5.5% of GDP by 2000. Health expenditure is not always an indicator of the size of health problems, since it relates to growing incomes and a greater demand for healthcare that need not be directly indicative of underlying health conditions.

For an idea of how large a burden air pollution is, the measure used was QALYs (quality adjusted life years) rather than cost-benefit analysis. This was to take advantage of was the existence of detailed data of mortality and morbidity by age from the Global Burden of Disease (GBD) initiative (Ezzati et al, 2003) tracking cause of death and disease by regions.

The QALY approach assigns weights between 0 and 1 for years of life lived in morbidity, and thereby obtain comparable indicators reflective of the impact of health conditions. Lower respiratory infections, chronic obstructive pulmonary disease and tuberculosis are important causes of disease burden in lower mortality developing regions (2.4 to 4.1% of

the burden), while lower respiratory infections account for as much as 8.2% of disease burden in higher mortality countries.

The participants agreed that caveats are in order in interpreting the data. Definitions of variables like urban population are not standardized, and do change over time. Further, measured disease burden need not imply direct causation, including environmental or pollution related causation. Functional relationships used in partitioning morbidity by causation like exposure to pollutants tend to be derived from US studies, and need not be universally applicable.

GBD studies on environmental causation of morbidity and estimates of exposure indicate that outdoor and indoor air pollution respectively contribute to 0.5% and 4% of deaths in Africa and 3% and 4.5% of deaths in the West Pacific inclusive of China.

Krupnick noted that the burden of disease due to air pollution was not as key an element as an analysis of how efficient it is to control morbidity and deaths due to pollution. It may be more efficacious to control urban air pollution than, say, tobacco. Again, it need not be cheaper, though admittedly, the control of indoor pollution would be fairly inexpensive.

Krupnick presented an overview of the major pollutants, and emphasized that the levels of all of these are interlinked. Sulfur dioxide and NOx (oxides of nitrogen) are transformed into other noxious pollutants, and ozone. The interrelatedness of the pollutants is an important fact for successful policy, and a fact not fully appreciated, even by the EPA. Mandating rules and levels for the individual pollutants is not always correct given that their levels are interlinked.

Next in the analysis was an examination of how averages of air pollution changed between 1986-92 and 1993-2000 for cities belonging to the four income groups within developing countries. Measurement of air pollution is done using WHO monitors in cities, with three monitors per city to capture pollution representative of industrial, commercial and residential localities. Measurement needs to be precise, and needs to follow standardized guidelines—a study in Ukraine reported implausibly high pollutant readings owing to rust in the filters where monitors were placed. World attention has been drawn to the problem of PM_{10} (particulate matter with diameter less than 10 microns). The worst trends in averaged PM_{10} levels were for low income countries (26 micrograms per metre^3), while high income and middle income countries experienced some improvement. Similarly, the least improvement in SO_2 levels was for low income countries (just 1 day less of SO_2 levels exceeding permissible levels). Krupnick clarified a query from Barbier to say that the figures measured absolute falls in levels and not percentage changes in concentrations.

Sterner checked on the definition of low income countries employed. Krupnick said the year 2000 definition was used, and Sterner pointed out that this could understate improvements, since countries previously classed as low income might have had

improvements in income, and might have moved out of the group by 2000, so that their improvements would not be accounted as changes to the low income group.

Strand noted that the very fact that pollution levels actually reduced, even if these reductions were small, could be used as a rule of thumb to assume there had been improvements that were not insignificant. This is because, given the rates of growth of the countries' population, doing nothing would have translated into greater pollutant readings.

Hamilton noted that further quantifications might be possible in aiding policy. Estimates have been made of the dollar value of QALYs and DALYs saved by health practices such as hand-washing, and of the cost per DALY saved. Analogous estimates could be done for pollution control.

Krupnick mentioned that his analysis of the policy instrument side was similar in spirit to Sterner's in not being doctrinaire about the policy options, and preferring "whatever works" in a particular circumstance. Command and control instruments were not ruled out given countries' different circumstances. Policy may seek to create pricing differentials via subsides and taxes and would also need to account for subsidy burden. Similarly, the degrees of freedom a regulator or government has with regard to pressure groups also factors into decisions of what instrument to implement.

Policy instruments were presented first for stationary/ point source pollution, and then for mobile source (largely vehicular) pollution.

Toman noted how, in some of the more complicated examples of policy, when there is uncertainty about how the industrial sector would evolve (as in the Malaysian experience), there may be virtues in simple pollution control rules. Non-linear pricing rules may have very distortionary effects, and also be detrimental to dynamic efficiency.

Stiglitz noted two strands in the discussion. Arguments about the merits of less or more rigid environmental rules merit evaluation against the Porter hypothesis that high environmental standards might actually increase industries' competitiveness.

In a different vein, it might be important to account for the interactive effects of morbidity in developing countries which imply that the impact of policy on morbidity might well be non-linear—there may be more than proportionate gains involved from a particular action. This observation points to enormous distributional consequences of policies that do not address years of healthy life lost in developing countries. The strong interactive nature of diseases is especially important for jointly addressing HIV and sexually transmitted diseases and also the link between tuberculosis or asthma and the impact of air pollutants. One valid criterion for contrasting developed and developing countries—possibly relevant for the papers at hand—could be the strength of interaction effects in phenomena like health.

Krupnick provided one counterpoint in the fact that air pollution disproportionately hits the very young and the very old. Consequently, the dose response functions to pollution in developing country contexts are potentially less steep than those in developed countries. This would reflect the occurrence of deaths of the very young and old at lower levels of exposure. Those surviving and exposed to higher levels of pollution would also be the fitter members of the population. Thus the incremental effect of pollution on their survival could, on average, be less harmful than the same effect on a developed country population that did not experience as many deaths at lower concentration levels.

Krupnick brought up the experience of Taiyuan city (population 2.7 million), capital of Shanxi province, China. The institutional circumstances for pollution policy design had seemed positive, with national and provincial governments committed to reducing SO_2 levels by 2005. The goal of Resources for the Future (RFF) was to design an SO_2 permit trading system in the city, and aid in training and demonstration of pilot trades. Positive outcomes were a basic emission monitoring system, enforcement tracking system and allowance tracking system, training to local people, and also writing a regulation that was passed by the city giving the EPA authority in putting the system in place.

A less positive outcome was that the very low cap on total penalties that firms could be made to pay was not eliminated. Similarly banking, i.e. using allowances to cover emissions during a particular period, has not been allowed as yet.

Stiglitz enquired if there were social or Party pressures operating to ensure compliance by firms. Krupnick answered that moral suasion by Taiyuan's administration, and articles in the press served as countervailing forces. Sterner noted how examining complaints lodged with an official agency or tracking the number of articles in the popular press on an issue can be an indictor of popular perception and pressure. There is a case for going beyond the price system in studying impact of policies.

Mobile source pollution in developing countries is an important problem for cities given the growth of vehicles per thousand population, and increasing passenger vehicle shares (for instance, an increase from being 31 to 49% of China's vehicle fleet between 1990 and 1996). Lead and sulfur levels are especially harmful to human health. High particulate matter emerges as an important pollutant in places like Manila.

Lead in automobile fuel has an epidemiologically tight relationship with levels of lead in the blood. There have been reductions worldwide, with cities that are more successful at controlling automotive lead also being more successful in reducing blood lead concentrations. Take-up of policies varies in countries. Krupnick cited the case of Manila where feasible policy recommendations have included price differentials to modify fuel usage, and taxes on sulfur content in diesel. Action to implement these policies was not forthcoming, in part due to pressure by local refiners to delay mandated pollution reduction standards, and an appeal to protectionist arguments.

In conclusion, Krupnick noted that while the estimated health impact of air pollution may not be extremely large, the particular type of pollutant in question is important. While

the EPA identifies particulate matter as a major health risk, there is a difference between the how different components – NOx, SOx impact health. This also calls for problem specific application of policy instruments.

3.4 Energy and poverty

Michael Toman presented Douglas Barnes' and his paper on energy-poverty linkages. One issue the paper addressed, and that could be built upon, was indoor pollution, and this would supplement the focus of Krupnick's paper on outdoor pollution. The paper, however, required tightening, and a streamlining of the more anecdotal reference it contained.

Toman presented stylized facts of energy consumption by the poor—the reliance on biomass, the fact of modern petroleum fuels being a luxury for the poor in many developing countries, and the fact that fuel wood is often expensive, especially when we account for the time prices involved in its collection. Normalized for quality, modern energy sources often emerge as less expensive. Edward Barbier pointed that the comparison mentioned referred to delivered prices. There are upfront costs that a modern grid based energy distribution system often comes up against.

Toman noted that recommendations to expand the role of private players and restructure the energy sectors are valid, but need to balance concerns of poverty alleviation (and the possible loss to the poor from restructuring) and sectoral efficiency. Stiglitz posed the question of why it was difficult to design subsidies targeted through private providers, and why it was easier to target through government programs. Toman added that the industrial organization literature does provide conceptual tools, which should be operationalized in moving from public to private providers. He went on to provide data on shifts in choices between cooking fuels in Hyderabad, India, noting that the move to modern sources occurred in stages, so that a household might simultaneously rely on electricity for lighting and biomass for cooking fuel. The burden of energy costs on incomes is disproportionately larger for poorer households.

Toman requested feedback on the analytical structure he wished to use to formalize some of the observations of the paper. Conceptually, given the marginal value product curve for energy, lower costs to energy would increase consumer surplus. What if the outcome of lower energy costs was not more (observed) income, but greater productivity of human capital. We could also conceive of a composition effect, of a change in type of energy source improving quality of living standards. Again, shifting to a modern source may involve higher costs per lumen, but what if it were also accompanied by improved education and flexible allocation of household time? These indicate there are other sources of surplus not captured by considering a fixed-value-of-technology model.

Lopez observed that whether we miss out on capturing all the effects of shifting between energy sources would depend on how marginal value product was being measured. A reduced form of the social value calculus would capture the impacts Toman mentioned.

Hamilton pointed to the potential of using the World Bank's Demographic and Health Survey, which might capture the impact of switching between energy sources on dimensions other than the monetary one. He recollected associations between increased electricity availability and lower under-five mortality, and noted that there were papers written at the Bank that might be of relevance. Studies exist that attempt to parse out impacts and complementarities on agro-processing, more productive pumps for irrigation, a more localized division of labor and the health effects of better energy sources.

Toman cited Douglas Barnes' previous work on energy in rural village settings in Peru, the Philippines and India documenting the lower effective costs to the rural population of modern energy sources for irrigation, an improved ability to allocate capital, and a willingness to tie up capital for a reliable energy source. Lopez pointed to a caveat in comparing modern and traditional forms of energy. The cost of a modern source is mainly in terms of cash, while that of traditional sources is largely in terms of time. Consequently, the impact of a modern source in a context of unemployment need not be all positive. Toman countered that even traditional energy sources often have active fuel markets, and families make cash outlays towards these fuels.

Strand extended the applicability of the analytical framework to water resources. Having a water source in the house is associated with lowered rates of disease and hauling costs. The chapter dealing with water might be able to take up an analysis of these non-monetized gains.

Sumeet Gulati was of the view that while modern fuels might have lower costs, ensuring their availability and reliable supply could be quite difficult in a developing country. Toman noted that Barnes' work indicated that the argument of taxing modern fuels to restrict access was often not a good idea since it slowed down access to fuel. An attempt might instead be made to manipulate fuel wood prices.

Stiglitz directed the discussion toward the scope for targeted subsidies for the poor. One example would be subsidizing the purchase of modern stoves. Toman felt that not adopting a superior technology does not indicate a lack of understanding of risks or of the cost calculus on the part of the poor. Experience suggests that there are deeper costs to technology adoption that are behind the lack of universal success stories.

Stiglitz observed that this could point to an interesting paradigm—by not giving away, i.e. by not subsidizing some types of activity beneficial to the poor, a country might actually be losing resources, including natural and public resources that the poor are forced to fall back on.

The discussion moved onto issues involved in the transition to more commercial forms of energy. Some points that emerged were the need for complementary policies that enable forest growth, addressing problems of open access, defraying infrastructure costs of modern energy sources and the often implicit rationing of energy on account of foreign exchange constraints. Sterner noted that forests are important to addressing climate

change. Wood itself can be harnessed as an energy source in sophisticated ways, as Sweden has demonstrated.

In this context, Barbier felt that subsidizing plantations might not be easy in the transition period between fuel sources. An attendant risk was that if the rural poor saw no value for fuel wood, they might convert forestland into agriculture. Similarly, a switch to hydrocarbon fuels like petroleum could make agro-forestry, which is valued for fuel, crop and soil protection uses, less attractive. Toman pointed out that internalizing soil erosion impact could necessitate on-farm and off-farm measures—the former are at the household level, and it is the latter that would stand to lose from the effect that Barbier highlighted.

Toman's take on electrification was that national grids do not necessarily solve energy problems despite their laudable goals of greater economic efficiency and increased participation in the modern economy. The case for lifeline subsidies to electricity can be defended, but the tendency is to express these exclusively in terms of units of energy consumed. Consequently, reductions in these subsidies are accompanied by losses, and a disincentive against expanding power availability. It might therefore be appropriate to subsidize the expansion of electricity grids, or to subsidize off-grid electricity generation. The fact that rural electrification is unlikely to be profitable needs to be acknowledged.

On the issue of how electrification in the US in the 1930s was subsidies by appealing to social concerns, Stiglitz noted that a public works expansion argument enabled the process. Projects like the Tennessee Valley Authority consciously responded to social needs that private markets were not filling, and this analogy extends to developing countries.

Toman's perspective was that, while the paper was not intended to explicitly address issues of privatization, it could point to issues in a context of a worldwide shift toward privatization. This shift has occurred in power generation rather than in transmission; the latter is a case of natural monopolies arising from falling average costs. One option in this context is to accept the development, and to inquire into the viability of grid expansion, financial incentives for the same, and prospects for enabling self-financing systems. Another option is to think not in terms of grid expansion, but to look at intermediate level solutions, such as village electrification without connection to a national grid. This option connects to the issue of credit availability.

Strand observed that one issue that had been left out was that population distributions are often endogenous, so that policies of electrification and water supply have impacts on migration.

Barbier felt that the non-grid options advocated would need the paper to address complementary policies that can ensure the success of quasi-decentralization. Toman however felt that the paper was not in a position to advocate, but could provide an ecumenical approach to analyzing experiments and issues such as who pays for a micro

grid at the village level. This would serve to indicate the existence of options in addition to the oft-advocated national grids.

Bernardo Mueller argued that privatization need not imply an automatic lack of extension of rural electrification. Quid pro quo mechanisms can incorporate rural extension targets for private companies.

Toman cited evidence of electricity prices tending to subsidize the middle class in developing countries. Barbier felt that one spin off of developing a good indicator of the spill-over of using different forms of energy onto aspects like productivity could be that it can help in identification of communities to which electrification needed to be extended on a priority. Saleth provided an example of how targeted subsidies could work in a private sector environment. Santiago, Chile, had seen the corporatization of utilities but was able to preserve a targeted subsidy component for the poor. The subsidy was received from the State, and ensured finances were not distorted.

Penultimate Discussion

Ramon Lopez summarized some important issues emerging from the workshop, as well as issues that needed to be addressed.

While the focus of the discussion was largely on economic growth and the environment, a problem is that existing growth models tend to be very aggregative in their treatment, and provide little guidance to policy from the Task Force's point of view. Lopez and Toman were to take stock of the literature in this context.

Second, only marginal weight had been attached in the chapters to local empowerment, an important policy issue that is often ignored. Protecting forests in Asia and Africa depends critically on local participation and there is considerable support for the issue amongst international donors. Some discussion is required on whether the international support has translated into monies well spent on local empowerment.

Lopez's next concern was that policy needs to be placed in context. This is especially true of Latin America, where he was increasingly convinced that the political will for environmental regulation was simply not there for a gamut of reasons. While theory provides the tools for optimal design of market based instruments, there is little use of these in the absence of a conducive political context. The discussions on political economy and those on the conception of instruments could merit greater linkages.

There does exist enforcement of environmental concerns in developing countries, but, as Lopez put it, much of this is related to pressure from the outside, including importers in developed countries. This makes for cross linkages between the chapter on trade and the two chapters addressing market institutions. He had pointed earlier to the stark difference between agricultural and pesticide norms for Latin American produce aimed at the export market, and that aimed at local markets.

Michael Toman suggested that Copeland and Gulati incorporate elements of the discussion on harmonization and international standards.

Lopez raised the domestic policy issue of facilitating transfer of institutions and technologies. Sterner noted how the lack of political will could be endogenous to the policy instrument in question. The popularity of an instrument increases its legitimacy, and makes for greater political acceptance. Institutions that impose less of an extra burden on citizens are important in this context.

Hamilton highlighted a few points he felt were missing overall. One was the linkage between water resources and under-five mortality. Another was references to the "conflict diamonds" literature with its focus on Botswana's case, and the costs and benefits of resource based development. A third area was environmental income sources in developing countries. A stock-taking paper on the agricultural industry (Boyle, World Bank) indicated that 40% of incomes are derived from the harvesting of wild/ naturally growing goods as distinct from agricultural produce. Implications would be to understand if poverty measurement surveys miss out on important forms of sustenance, and the extent to which the poor are dependent on naturally growing resource wealth. This knowledge could inform the debate on property rights.

Lopez drew attention to trade and environment literature on international agreements on carbon sequestration and similar issues. Developing countries with vast forest resources could unlock considerable value if the role of their natural wealth in carbon sequestration was fully acknowledged and they received payments for global services thus rendered. He also noted that the quantification of potential values of policy actions is important, and needs to be incorporated.

Stiglitz pointed to a need to bring out international and local interactions on environmental issues, and Toman said a matrix of chapter interactions would help streamline some of these issues. Addressing Jon Strand's query on issues of growth, Toman and Lopez felt that the introductory chapter was an apt place in which to address the topic. Either the growth environment linkage would have to be delineated, or a solid justification for not taking up growth extensively would have to be provided.

Strand raised the issue of migration, and how environment and resource factors impact the flow as an area that had been left out, and Stiglitz pointed to population and environmental pressure as other concerns. Toman took stock, saying that environmental sources of income needed to be covered. Migration and demography are more complex areas, and it might not be feasible to go in for a full paper on these topics. Stiglitz however felt that if the consensus was that the topics warranted closer examination, possible authors could be found. He mentioned Maureen Cropper at the World Bank. Krupnick mentioned a possible lead for a paper on population.

Stiglitz felt that if themes on population were incorporated, the focus could be on the extent to which population issues are the consequence of market failures and the lack of social security mechanism, and the links between population, rural economic

development, the move to cities and the questions of managing urban areas problems. Indeed, the overall theme of the volume was market failures as seen in the context of environment. To the extent that issues of rural-urban demographics and development have a consequence on environment, they are problems meriting enquiry by the Task Force.

Closing Remarks

Michael Toman expressed the view that the proposed IPD volume on environment would gain from a contributory article from Joe Stiglitz, who agreed to write such a piece.

Joseph Stiglitz covered four areas of concern to the Task Force.

There is a strong environmental movement that often positions itself against growth, and it is important to deal with this in the volume, possibly in the introduction. There needs to be a position that the option in many areas is not to do nothing. For instance the issue is not one of "dams versus no dams", but often more nuanced, say one of micro dams versus other types of dam.

Environmental justice is a second area requiring attention, given the adverse effects of environmental degradation on the poor. The fact that the poor often habit polluted areas has a dimension that is harder to address—locational attributes may be a part of compensation, as an outcome of a market equilibrium. It is important to emphasize that the fact of the poor moving to environmentally damaged environments does not directly imply bad environmental policy, but may be the consequence of lower land values.

The third issue is the use of trade sanctions for enabling good environment policies – green tariffs, for instance. The issue at hand, admittedly a controversial one, is whether trade can be used to improve the environment. Stiglitz's view was that where the issue of concern is one related to the global environment, not charging for the use (and depletion) of the environment would be a subsidy, so that a tariff should be charged. If, on the other hand, a country chooses an environmental action that does not have a global consequence (say a sulfur dioxide level that does not impact other countries), the case for a tariff is weak. Brian Copeland noted that this was the logic of WTO positions on the issue.

The endogeneity of the political system is another issue that was underscored by the workshop's presentations. Akbar Noman mentioned that the political economy is important in terms of the speed and scale of privatization, and the way this changes property rights.

Joseph Stiglitz noted that finance is an issue that had underlain the discussion, though not addressed specifically. At the macroeconomic level, one reason for environmental degradation is that governments, in their budgetary frameworks, treat certain types of investment that could be justifiably viewed as environment-preserving as items of consumption. These items are then the target of fiscal cost cutting.

On the flip side—as in the debate on takings in the United States—a change in environmental regulation is often viewed as a deprivation of property rights, a view that can be made to fit into view of "secure property rights". This can, at an extreme, imply no environmental legislation without compensation. Stretched to cash-strapped developing countries, the perverse outcome can be that a country without budgetary provision for compensation undertakes no environmental legislation and appeals to its inability to compensate for the potential curtailing of property rights.

Jon Strand revisited macroeconomic concerns relevant to his chapter. While the argument that high interest rates in a recessionary context would induce open access resources to be depleted faster is sound, it is not easy to find quantitative evidence. Environmental impacts, as in the context of the Indonesian crisis have often been anecdotal. Joseph Stiglitz pointed to the need to interpret results carefully—as, for instance, a World Bank report that the net effect of the Indonesian crisis on the environment was positive. Recessions have an income effect, and a switching effect. Jon Strand elaborated that one impact of recessions is that contraction in output and incomes can reduce investment (the income effect). The other impact is that those living off resources could tend to extract resources more quickly, as would a government strapped of revenue. Edward Barbier's simulations of the impact of a crisis on Thai shrimp farming showed analogous results—a negative relation of volume of shrimp farming with GDP, and a positive link to the exchange rate.

Jon Strand's second point was about the linkages of monetary policy and interest rates to threat of resource extraction. The interest rate link (a positive relation to rate of extraction) seems more obvious, while the foreign exchange effect is more difficult to predict. A short run devaluation, and the consequent rise of export revenues, should increase extraction, while a more permanent devaluation should give rise to the countervailing effect of increased incomes over time and an incentive to preserve resources.

Michael Toman concluded the session and the workshop thanking the participants for their contributions, and indicating that Ramon Lopez and he would meet in the coming week to incorporate comments from the workshop in refining the overview section, and to address specific comments to the participants on their chapters. He said the end of the year/ early next year is a good target date for publishing the volume.