

Summaries

Economy-wide gains from decentralized water allocation in a spatially heterogenous agricultural economy

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This paper considers the allocation of water in a spatially heterogeneous irrigated agriculture, and evaluates the economy-wide benefits from establishing property rights to water that private agents may then rent in/out to others. A detailed economy-wide model of the Moroccan economy is developed with major attention given to seven irrigated regions whose water supplies and distribution are managed by seven water authorities (ORMVAs). Each water authority supervises at least two irrigation perimeters, for a total of 20 perimeters. Of the 88 production activities modelled, 82 are in agriculture or agriculture-related activities, including 66 in crop production, five in livestock, and 11 in processing agriculture, both up and down stream from the farm firm. The 66 crop production activities are further distinguished by being within or outside the seven ORMVAs.

Given policies in place, including the historical water assignments to farmers made by the water authorities within each perimeter, the model is solved so as to reproduce the base data, as well as to provide estimates of the shadow price of water for each water assignment to each crop in each perimeter of each of the seven ORMVAs. The level and disparity in shadow prices within a perimeter provides insights into the degree to which current policy allocates water to the most productive crops. Differences between perimeters and regions reflect differences in agro-climatic conditions, irrigated infrastructure, and farm technology.

The policy analysis is to presume that farmers are given the user rights to their historic water assignments. Then, within each of the 20 perimeters, farmers can choose to allocate all or some of the water assignment to themselves or rent their assignment in or out to others and receive compensation. The compensation received is determined by the clearing of a perimeter's water market. Since obstacles to trading water between perimeters cause high transactions costs, the resulting market rental price of water varies by perimeter.

The conceptual section of the paper uses a general equilibrium framework to show the conditions under which the resulting market clearing price of water will be above, below, or within some bound of the shadow prices of water, estimated based on no water trading. That is, it is possible for a water market to lead to a marginal value product of water that is lower than the pre-water-market value. The two major determining factors are shown to be the share in total production cost of other inputs, such as labour and capital. When water trading results in a relatively large re-allocation of water compared with the water assignments, then relatively large changes are also observed in the employment of labour, capital, and other inputs. This re-allocation causes changes in factor prices, which in turn are shown to affect the shadow price of water. Another implication is that in perimeters where irrigation water is scarce due to elevation or the stock of water available, crops tend to be grown that save this scarce resource. The result is that other factors of production tend to have a relatively high share in total costs. In these regions, the re-allocation of water has a greater impact on its shadow price than in regions where water is relatively more abundant. This framework is used to explain the empirical results.

The results suggest that such a mechanism could increase agricultural output within the seven ORMVAs by 8.3 per cent. The output of fruits and vegetables increase the most, while the production of wheat and fodder tends to decline. Water reform is shown to have economy-wide effects, to place downward pressure on the cost of living, to increase net agricultural trade, and to increase rural farm income. The effect on rural wages is slightly negative, but the income of small, medium and larger farms increase. The market price of water, relative to the average shadow price of water pre-water market reform, rises in 16 of the 20 irrigation perimeters of the seven ORMVAs. The increase ranges from a low of 1 per cent to a high of almost 52 per cent, while the declines in the four remaining perimeters range from a -0.27 per cent to about -25 per cent. The allocation of water to its most productive use also tends to raise the productivity of other resources, and hence their rental rates, such as agricultural capital and land that is specific to a perimeter.

Wildlife conservation policies and incentives to hunt: an empirical analysis of illegal hunting in western Serengeti, Tanzania

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This paper investigates factors determining participation and effort in illegal hunting, using cross-section survey data from households in western

Serengeti, Tanzania. The survey was conducted in the period June to August 2001 among local communities along the western border of the Serengeti National Park. This area has experienced a rapid growth in human settlement that coincides with a marked increase in the number of poachers arrested in the park. Today, Serengeti National Park and its surrounding game reserves contain the world's largest ungulate herds, but the illegal killing of the migrant ungulates is potentially the most serious threat to the Serengeti ecosystem.

One purpose of this paper is to study the impact on illegal hunting of the integrated conservation and development project established in this area, namely the Serengeti Regional Conservation Project (SRCP). The paper also investigates how the pattern of crop production in agriculture, market accessibility, and wildlife-induced damage to crops and domestic animals affect illegal hunting. The empirical analysis is presented in three steps. First, the probability of participation in illegal hunting is investigated using a probit model. The results suggest that this probability depends on location in terms of district and is inversely related to the amount of maize production.

The hunters in the sample can be divided into two groups. One group is constituted of hunters who go on hunting trips, usually into the protected area. The other group represents hunters who do not go on hunting trips, but instead hunt within the village area. In the second step of the empirical analysis, an ordered probit model shows that there is no difference between the groups of hunters on how they respond to changes in the explanatory variables.

The third part of the empirical analysis investigates the intensity of hunting conditioned on participation in illegal hunting. The results of a Tobit model show that hunting intensity is inversely related to participation in SRCP. In addition, hunting intensity is negatively related to cotton and maize production, as well as wildlife-induced damage to crops and domestic animals.

Opportunity costs of conservation in a biodiversity hotspot: the case of southern Bahia

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The trade-offs between conservation and development might at first glance appear to be keenest in 'hotspots' – habitats of high endemism that have already lost most of their original extent. The high degree of natural habitat loss and fragmentation in these areas reflects generally longer histories

of human habitation and higher human population densities than more remote, less disturbed areas. This suggests relatively high agricultural land values and thus high private and social opportunity costs of conservation. However, this assumption, while plausible, has rarely been confronted with data.

This paper presents data on land values in southern coastal Bahia, Brazil, comprising fragmented habitats of extraordinary biodiversity importance. In 2000, we undertook a sample survey of rural properties sold in the previous two years, obtaining sales price and detailed characteristics data for 231 properties. Survey data were supplemented with information on slope, soils, and climate obtained by georeferencing property location to 1:250000 scale biophysical maps of the region, and to road maps. We regressed per-hectare price on property characteristics. The regression results show agricultural attractiveness to determine strongly the value of land. Higher slopes are associated with lower land values. More favorable soils are associated with higher land values. Most importantly, presence of secondary forest cover was associated with a one-third reduction in land value, other things equal; primary forest cover was associated with a 70 per cent reduction. The low values of primary forest may be a selection effect: remaining unconverted forest land may be particularly unsuitable for agriculture. Or, the lower values may reflect laws restricting deforestation – though these have been imperfectly enforced.

Regression results were applied to biophysical and other map data to impute land values across the region, using a 990-meter grid. The imputed median value of all non-urban, nonprotected land is R\$725/hectare (approximately US\$400). For illustrative purposes, we assess the cost of 'high forest cover' grid cells: those that contain some primary forest and have a total tree cover (primary, secondary, and cacao) of greater than 80 per cent. We use Thomas and Carvalho's delineation of eight biologically distinct ecological zones within the study region. We identified the least expensive 10,000 hectares of 'high forest cover' land in each of these zones; the mean value of these lands was a modest R\$264/hectare. Moreover, these lands tended to be contiguous within most of the zones, an important consideration for habitat viability. At the same time, there are ample quantities of nonforested land, with good quality soil, not in current use for cacao or for forest plantations.

The results suggest that in south Bahia, there are relatively low opportunity costs for conserving representative examples of the region's unique biodiversity. Despite the region's long settlement history and considerable population, conservation–development trade-offs may be modest.

Water markets and demand in Central American cities

JON STRAND AND IAN WALKER

This paper analyses data from sample surveys of water use and prices for households in 17 major cities in Central America and Venezuela, from the late 1990s. The surveys were conducted in virtually the same way in all cities, making a pooling of the material meaningful, and making it probably the largest and most diverse such data set in current existence. In some of these cities almost all sampled households have tap connections to the water system. In others, notably Tegucigalpa and Guatemala City, many rely on non-tap ('coping') sources. Coping households were found to use less than one-fifth as much water as metered tap households do. The average water prices paid by coping households is about ten times as high as those paid by metered tap households. These prices however vary substantially across modes of non-tap water service. Apart from bottled water, prices are highest for water delivered by tank trucks, which is typically about 25 times as expensive as tap water. The other extreme is water taken from private wells, which is virtually cost free to users. In general, coping households are far poorer than tap households, face substantial water hauling costs, and (except in a few cities with access to substantial private well water) have a marginalized water consumption. In all, this implies a substantial burden associated with not having in-home water connections. We estimate water demand functions for metered tap households only, for coping households only, and for the pooled data set of metered tap and coping households. Increasing block rates complicates estimation on metered tap households, as it implies that water demand and prices are positively correlated as households with high water consumption face high marginal and average water prices. Using 2SLS, we find price elasticities of water demand, with respect to both average and marginal water price, of about -0.3 . Average price is found to have the greater partial effect on demand, in contradiction to theoretical arguments but in accordance with previous empirical findings. Coping demand is found to have a lower price elasticity, closer to -0.1 . Coping demand is also negatively affected by the magnitude of hauling costs. We also do some estimations on the joint data of metered tap and coping households. A main result here is that the water connection itself explains most of the difference between tap and coping consumption. This indicates that the basic structure of water consumption is quite different, between tap and non-tap households, and that there are serious econometric problems associated with attempts to pool such data sets.

Factors determining household fuel choice in Guatemala

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Traditional use of solid fuels can have severe adverse consequences for human health, productivity, and the environment. Promotion of clean and efficient energy therefore forms part of the struggle against poverty and underdevelopment. This is often done through policies to promote interfuel substitution and improved stoves. Such interventions have in the past been guided by the energy ladder model, which predicts household fuel switching in response to rising incomes. The energy ladder model, however, has trouble accounting for the widespread incidence of multiple fuel use and for other determinants of fuel choice. A household economics framework can help illustrate how the opportunity costs of firewood collection also shape household energy decisions.

Household energy consumption patterns and the opportunities and constraints for interfuel substitution are analyzed using survey data from Guatemala. LPG (bottle gas) is a fuel for the urban and the better off. Firewood is used by almost everybody in rural areas in full or in part, and the same is true for almost half of urban households. Multiple cooking fuel usage is widespread and it is common to see modern fuels used alongside traditional fuels. It is therefore a mistake that household surveys in many countries only ask for one or two major cooking fuel(s). In Guatemala, urban cooking fuel combinations typically involve LPG, wood, and charcoal (in that order). Even the top urban quintile has widespread wood usage, at 23 percent. Rural cooking fuel combinations usually include firewood, sometimes LPG, and occasionally a small amount of kerosene.

The ability of modern fuels to displace traditional use of solid fuels—thereby combating indoor air pollution and other ills—needs to be re-examined in light of multifuel use. Most households who have adopted LPG also cook with firewood or charcoal. In fact fuel complementation or stacking dominates in both rural and urban areas. It therefore seems that LPG at best is partly effective as an instrument for combating indoor and outdoor air pollution through wood displacement, with the best chances of success in relatively developed high-income urban settings.

Many users of firewood purchase it in markets, even low income and rural households. This is somewhat paradoxical, given that market wood is expensive—households purchasing wood spend large amounts, also in comparison with households that cook with LPG. This suggests a significant scope for LPG to increase its market share. Uptake costs and broad lifestyle patterns appear to be key barriers for enhanced LPG usage. Access problems do not seem important in Guatemala. The experience of those households who have abandoned firewood point to Metropolitan residence, having

electricity, small household size, education, and purchasing of ready-made food outside the house as some of the factors associated with fuel switching.

Household energy strategies must be based on the realization that large groups will continue meeting their cooking needs with fuelwood for the foreseeable future. Strategies therefore cannot rely exclusively on LPG, and a balance needs to be struck between policies aiming at inter-fuel substitution and policies seeking to ameliorate the negative consequences of fuelwood (improved stoves, better ventilation). Innovation for low-cost household energy technologies should be promoted. Improved stoves should be considered for areas with plentiful free wood. Promotion of modern cooking fuels is likely to meet with success mainly in those urban areas where people rely on expensive purchased wood and where determining factors such as infrastructure, education, and sufficient purchasing power exist.

Extractive non-timber forestry and agriculture in rural Vietnam

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Farm households supply labour for a wide variety of activities. Two main sectors for which they provide labour are the agriculture and forestry sectors. This paper explores some empirical links between these sectors and the demand for an extractive forest-good using data from rural Vietnam. The analysis is prompted by suggestions that forest goods might play an important nutritional role for poor households or serve as an important cash-source. Given the determinants of the demand equation, policy makers are served with important information for their policy-making. The paper sets out a theoretical framework from the strand of literature of non-separable household models. The theoretical framework calls for estimating the demand equation using shadow prices since we cannot argue that all markets clear. One theoretical implication of supplying labour to both sectors is that these particular households should equate shadow wages between sectors. We conduct a test to establish whether this is true.

The data set is from a household survey conducted during late 1998 in northern Vietnam and includes about 300 households and 62 extractive-good producers.

We estimate both the extractive collection and the agricultural production function while correcting for potential sample selection problem. The decision to collect the forest good is influenced by wealth and income streams just as we anticipate. The second part of the empirical section is

devoted to the agricultural sector. Here There we find that the decision to engage in producing the agricultural good is again influenced by wealth and labour income streams and some preference proxies.

The tests that we conducted show that we cannot reject equal shadow wages in the two sectors. This finding is reassuring for the subsequent demand estimation. In the estimation of the collection of the extractive good, we again use a sample selection framework to test whether our prior expectations are manifested. We found, for example, that in line with our theoretical expectations, increased wealth significantly reduces the probability of engaging in the collection of the extractive good.

We have also taken an interest in the characteristics of the demand for the extractive good. In the paper a non-separable model is used which indicates, that a household decides on production and consumption matters simultaneously. Instead of estimating demand and supply jointly as a non-separable model, we have estimated the demand under the use of relevant opportunity costs. Since prices are endogenous, we instrumented all variables containing endogenous matter. Price effects are significantly negative and imply a unit elastic price elasticity, while wage and household income are positive and significant when affecting demand.

We have furthermore found evidence that those households that use forest areas for extractive collection are likely to be poorer; seem to have lower exogenous income streams and slightly lower wage labour incomes. Hence, given the fact that some of these households use open access resources, it makes a strong argument for a poverty alleviation focus of forestry policies. If present users of open access areas were excluded from such a change in property regimes, they (the poorer households) might become worse off.