Essays on the Namibian Economy

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Abstract

This thesis consists of an introduction and four papers exploring various aspects of the Namibian economy. These aspects cover shadow pricing, environmental valuation and capital market development in Namibia.

Paper I estimates the shadow prices of capital, labour and foreign exchange for the Namibian economy. The results suggest that the shadow price of capital for Namibia is 7.2%. The economic costs of Namibian labour, as a share of financial costs, are 32% for urban semi- and unskilled labour, and 54% for rural semi- and unskilled labour. The economic cost of foreign labour as a share of financial costs is 59%. The estimated shadow exchange rate factor is 4% for the Namibian economy.

Paper II derives a set of accounting price ratios (APRs) for the various economic sectors of Namibia by using the Semi-Input–Output (SIO) Technique. An *APR* is the ratio between the market or financial price and the efficiency or economic value of a specific commodity or sector, which is useful for the economic analysis of investment or development initiatives. This larger set of APRs, derived on the basis of information contained in a Namibian Social Accounting Matrix (SAM), should be useful in improving the effective appraisal of development projects and other major investment programmes in Namibia.

Paper III analyses returns and volatility on the Namibian and South African stock markets, using the daily closing indices of the Namibian Stock Exchange (NSX) and the Johannesburg Stock Exchange (JSE). The sample covers the period from 4 January 1999 to 20 March 2003. The methodology has three main parts: (i) unit root tests, (ii) cointegration analysis, and (iii) volatility modelling. The results show that the two markets exhibit very low correlations, and there is no evidence of a linear relationship between the markets. Furthermore, a volatility analysis shows evidence of no spillover effects. These results suggest that the NSX could be an attractive risk diversification tool for regional portfolio diversification in southern Africa

Paper IV studies the determinants of property prices in the township areas of Windhoek, the capital of Namibia. The work's major finding is that properties located close to an *environmental bad* (e.g. garbage dump) sell at considerable discounts. On the other hand, properties located near an *environmental good* (e.g. a recreational open space) sell at a premium. These results provide evidence of the importance of environmental quality in lower-income property markets in developing countries. It is important, therefore, for Namibian urban planners to incorporate environmental quality into the planning framework for lower-income areas.

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I Humavindu, MN (2008): "Estimating national economic parameters for Namibia". *Umeå Economic Studies* 744. A shorter version of this paper has been resubmitted to the *South African Journal of Economics*.

II Humavindu, MN (2008): "Estimating Namibian shadow prices within a semi-input–output framework". Forthcoming in the *Journal for Studies in Economics and Econometrics*.

III Humavindu, MN & C Floros (2006): "Integration and volatility spillovers in African equity markets: Evidence from Namibia and South Africa". *African Finance Journal*, Vol. 8(2):31–50. Reprinted with permission from the Africagrowth Academy. The version published in the *African Finance Journal* contained typographical errors and a graphical omission; these have been corrected in the version published here.

IV Humavindu, MN & J Stage (2003): "Hedonic pricing in Windhoek townships". *Environment and Development Economics*, 8(2):391–404. Reprinted with permission from the Cambridge University Press.

INTRODUCTION AND SUMMARY

1. Introduction

This thesis consists of four self-contained papers analysing shadow pricing, capital market development, and aspects of environmental economics in Namibia. Paper I estimates shadow prices of capital, labour and foreign exchange for the Namibian economy for use in a social cost-benefit analysis. Paper II extends the analysis set out in Paper I by estimating sectoral accounting price ratios (APRs) for the Namibian economy. Paper III analyses the integration of the Namibian and South African equity markets. The ultimate aim of this analysis is to examine the scope for diversification for investment managers. Paper IV analyses the determinants of property prices in a low-income area of Namibia's capital, Windhoek. The focus is on the implicit valuation of environmental advantages and disadvantages in low-income property pricing markets.

Although these papers cover different aspects of economics, a common thread linking them is that effective project/programme evaluation, be it for developmental projects or capital-market development initiatives, can enhance decision-making. Another link between the papers is that missing or distorted market prices can lead to suboptimal investment decisions in a wide range of circumstances and for a wide range of agents, national planning agencies, local government, and private investors. This is becoming more important in the light of recent Namibian Government efforts to restrict the huge outflows of capital to neighbouring South Africa (IMF 2006, 2008; Bank of Namibia 2003). If successful, these efforts will lead to increased investment in Namibia, increasing the risk of suboptimal investments if markets remain missing or distorted.

Economic tools for project appraisal in developing countries have been well established since the early 1970s. The appropriate appraisal of public investment projects underlines the need to determine the social value of costs and benefits accruing from these investments. In developing countries in particular, social values may diverge from market prices and values. These price distortions may be caused by market imperfections as a result of both government interventions in product and factor markets, structural disequilibria in labour markets, and thin or missing markets. As a result of these distortions, market prices can be unreliable indicators of the real net worth of goods and services (Adhikari 1986). Official trade policy, such as the adoption of various tariff and non-tariff trade barriers, may lead to a distorted market value of foreign exchange. The result is a distortion in the domestic price of all tradables, but also of non-tradables which use tradables in their production. In labour markets, the equilibrium wage may be higher than the market clearing wage as a result of minimum wage laws and a union bargaining presence. In capital markets, the market interest rate may diverge from the marginal productivity of capital. For environmental externalities, there may not be any prices at all, potentially creating biases against decisions that benefit the environment, and in favour of decisions that harm the environment.

In project appraisal, therefore, modifications to market values are essential. A modification is determined by estimating a set of national parameters and conversion factors. These parameters are termed *shadow prices*. Conversion factors give the ratio between the price to be used in evaluating an input or output of a project (the *shadow price*) and the market price of that input or output. In the valuation of inputs used in production, the inherent assumption is that the price of any input should represent the opportunity cost of that input. The *opportunity cost* reflects the value of output forgone on one project when used on another. Thus, shadow prices are useful when the market price for an input or output is unavailable or

does not reflect its opportunity cost. For example, labour is an important input in many investment projects and, therefore, should be valued at its economic cost.

Shadow prices are a crucial link between the macro level and the project level of economic planning, and an important component of the overall process of development planning in developing countries. Only when the costs and benefits of all potential projects are valued at their shadow prices may those projects that most efficiently use scarce resources be selected. Following this strategy allows a developing country to maximise the potential net economic benefits accruing from its public investments, thereby improving its potential to pursue broader social, political and other non-economic objectives (Saerbeck 1989).

In general, national parameters to be estimated for economic analysis are divided into five categories (Potts et al. 1998): primary factors, traded goods, non-traded goods, average estimates, and the discount rate.

Primary factors relate to different categories of labour, the value of domestic resources, and foreign exchange.

Traded goods are goods for which the economic cost or benefit derived from their use is determined by their international prices. Shadow price estimation is essential where there is a significant difference between the border price and the local market price. Deriving the shadow price is also a necessity in situations where a benefit is likely to feature prominently as an input or output for a number of projects.

Non-traded goods are items that, by their nature, cannot be traded across borders, or may not be economically viable for trade. The estimation of a shadow price is prompted by a situation where there is a significant difference between the local market price of a resource and its economic value, or where, as for traded goods, a benefit is likely to feature prominently as an input or output for a number of projects.

Average estimates relate to sectors where cost data do not allow further breakdown. The most important of such estimates, the standard conversion factor, describes the value of a unit of domestic resources in terms of a unit of foreign exchange. The standard conversion factor, in the case of average estimates, is derived indirectly through conversion factors for traded goods.

Discount rates quantify the effect of time on a project's cost and benefit values.

At the national level, classic shadow pricing estimation would involve deriving a general equilibrium economic optimisation model with the following specific features (UNIDO 2003):

- An objective function, describing the effects of the use and generation of resources on a measure of economic value such as the gross domestic product (GDP)
- Constraints on the use of resources (technological coefficients for each economic activity and a limit for the resource as a whole), and
- Non-zero constraints for the value of resources, and non-negativity constraints for resources.

The shadow price is then the effect on the value of the objective function resulting from an increase or decrease by one unit in the availability of a scarce resource.

At the microeconomic level, numerous studies have been made estimating shadow prices for objective functions with one or a few non-market constraints. The distance function methodology, for example, is used in deducing shadow prices for pollutants (Lee et al. 2003). Namibian examples of micro-level shadow pricing include the shadow pricing of environmental goods (e.g. Humavindu & Masirembu [2001]; see Humavindu [2002] for an overview of other examples) and shadow pricing of fishing quotas (Stage & Kirchner 2005).

However, the estimation of nationwide shadow prices in this way is fraught with complexities and numerous constraints, and is usually infeasible in practice (Little & Mirrlees 1974). This has led to the adoption of 'second-best' approaches to shadow price estimations. These methods were developed in the late 1960s and early 1970s by the United Nations Industrial Development Organisation (UNIDO 1972, 1978, and 1980), and by Little and Mirrlees (1974), and Squire and Van der Tak (1975). The departure point of these approaches is the choice of unit of account.

In essence, the UNIDO approach uses a domestic resource as the unit of account, and it estimates the scarcity value of foreign exchange using a shadow exchange rate. This procedure is described as the use of a domestic price numeraire (Potts 2002). A second approach, developed by Little and Mirrlees (ibid.) and Squire and Van der Tak (ibid.), uses the unit of foreign exchange (expressed in local currency units) as the numeraire. The latter method is described as the use of a world price numeraire.

A third approach is based on the premise that all shadow prices are interdependent because their value depends on the value of inputs from other sectors (Potts 2002). These interdependencies are accounted for through conversion factors that are derived by solving a series of simultaneous equations using an input–output approach. Thus, this approach takes into account all the sectoral interrelationships: it is called the *semi-input–output (SIO) analysis*, and is useful for non-traded sectors where the output from each sector may appear as inputs into others.

In estimating shadow prices, the choice of methodology is primarily determined by the nature and extent of available data. Readily available data were a constraining factor in this study. Therefore, an initial attempt is made in Paper I to estimate the three primary factors: capital, labour, and the exchange rate. Paper II recounts how the SIO analysis was employed to determine accounting price ratios for the various Namibian economic sectors.

Despite the clear importance of shadow pricing for a developing country such as Namibia, no set of official national parameters exists; nor has any attempt been made to estimate them until now. The country's development path is guided by five-yearly National Development Plans (NDPs). These NDPs stress the importance of investment/development projects to alleviate chronic unemployment, low industrialisation, poverty, and income inequality. Under such circumstances, it is vital that market signals provide an adequate guide for investment planning and project appraisal. There is an apparent need for a consistent set of prices that reflects the resource costs and social benefits of a proposed course of action. High unemployment (36%), uneven income distribution, and an economy that exports most of its capital are all strong motivations for the estimation of a set of national parameters. Recently released national guidelines (*Guidelines for preparing the Third National Development Plan*

(NDP3): 2007/08 – 2011/12) reassert the importance of investment/development projects for Namibia's economic progress. Moreover, the government recently amended Regulation 28 of the Pension Fund Act, 1956 and Regulation 15 of the Long-term Insurance Act, 1998 to enhance the availability of funds for local investments and to deepen financial markets. The availability of more funds for local and unlisted investments stresses the need for the effective and prudent allocation of resources. In response, Paper I constitutes the first formal attempt to estimate the shadow prices of capital, labour, and foreign exchange for the Namibian economy. The estimation is based on data representing national averages and is to assist in efficient and effective decision-making in investment allocation. Paper II extends the shadow pricing analysis further, by employing an SIO analysis to arrive at sectoral APRs. The availability of sectoral APRs is useful when investment decisions are to be driven by sectoral allocations.

Cottoning on to the new initiatives for deepening Namibian financial markets, Paper III examines whether the NSX offers regional portfolio diversification opportunities for investors away from the JSE. This is essential to analyse, given the amounts of funds that now need to be invested in the Namibian economy. Previous studies have created the perception that the NSX tends to follow the JSE, implying that the scope for diversification by investing in the NSX is limited. This has led to limited interest from investors and to thin trading which, in turn, can lead to potentially misleading and volatile stock prices that may cause underinvestment.

Although the Namibian and South African economies are closely linked, it does not necessarily follow that the two countries' stock markets are linked. The NSX is primarily composed of dual-listed companies. The local firms listed on the exchange comprise only

0.3% of market capitalisation (IMF 2008). Companies having primary listings on the JSE and the London Stock Exchange respectively represent 44% and 55% of NSX market capitalisation. Moreover, the NSX overall index has always tracked the JSE, but the local index tends to follow its own path (IMF 2008, Bank of Namibia 2007). This makes it interesting to study whether the local firms provide more scope for diversification than studies of the overall index have indicated.

The methodology used encompasses correlations, cointegration and volatility modelling (Engle & Granger 1987, Engle 2001). Ceteris paribus, a low correlation between assets, means lower portfolio risk and opportunities for portfolio diversification. However, correlations induced by short-term trading can obscure long-run linkages among stock markets (Chen et al. 1986). To circumvent the problems associated with correlations, unit roots and cointegration analysis are employed.

Financial variables that have time-varying means and variances are termed *non-stationary* and have unit roots (Harris & Sollis 2005). However, non-stationary variables may have common trends, and may form stationary linear combinations (based on equilibrium long-run relationships). *Cointegration* implies a long-run co-movement between trended economic time series, meaning that there is a common equilibrium relation to which the time series have a tendency to revert. Stock markets whose indices tend to follow each other are said to be cointegrated. When they are, the equity markets move in tandem, and there are no long-term gains from international diversification.

Extending cointegration analysis a bit further, volatility modelling may be applied to further examine equity market integration. Moreover, it is important to ascertain whether an adverse

situation in one equity market actually spills over into another equity market. *Volatility* refers to the riskiness of stock prices and is an important determinant of the cost of capital for an investment project underlying the stock or portfolio of stocks in question. The models of conditional volatility commonly used in finance imply that there may be predictable patterns in stock market volatility. Such models imply that investors can predict risk, thereby assisting in investment decisions. Where an investor has forecast future prices to be volatile, they might opt to leave the market or require a much higher premium.

Shadow prices based on national data averages have to be distinguished from sectoral, regional or project-specific parameters (Saerbeck 1989). Ideally, project-specific parameters should be estimated for each individual project because the opportunity costs of the resources used or produced may differ from project to project, due to the specific characteristics of each project. This can be applied, for example, to aspects of urban planning. The economic value of an urban housing project for lower-income residents may be higher if it is located near environmentally beneficial features (such as parks) and public amenities (such as schools and taxi ranks), compared with one located near environmental hazards or far from public amenities.

Paper IV is an application of the hedonic pricing methodology (Rosen 1974) to study the determinants of property prices in a low-income area of Namibia's capital, Windhoek. The methodology uses property prices to estimate buyers' implicit valuation of a property's attributes (such as access to public services, proximity to environmentally beneficial or detrimental features) when trading takes place. Local authorities in Namibia are responsible for the provision, operation and maintenance of most municipal infrastructure and services. Although this simplifies the planning, design, financing and implementation of initiatives for

upgrading poor settlements as well as the development of low-cost housing schemes, for example, it places considerable responsibility on local authorities to ensure efficient urban planning.

Frayne and Pendleton (2001) allude to the high rates of internal migration and urbanisation in Namibia. This puts enormous responsibility on local authorities to ensure efficient urban planning and that the investments made are prudent. Failure to account for this might lead to developing residential areas or serviced plots alongside environmental 'bads' such as garbage dumps, which could prove detrimental to social welfare if households attach importance to such issues.

The valuation of environmental assets and services would underline their economic importance and make a case for their conservation. The incorporation of shadow prices of environmental costs and benefits in planning falls within the ambit of non-market valuation in the environmental economics discipline. Non-market valuation is a measure of the willingness to pay for the value of unpriced environmental goods and services.

Generally, for non-marketable items (those that cannot be sold or bought), two groups of valuation methods are employed (see Hufschmidt et al. 1983). The first group is the *revealed preference approach*, in which consumer behaviour towards environmental goods is analysed and values are inferred. Peoples' preferences are revealed by their choices. The second group of methods is applicable when consumer behaviour towards environmental goods cannot be observed. The solution then is to apply what is termed as the *stated preference approach*. The approach rests on the simple premise of putting hypothetical questions to consumers.

The hedonic pricing method used here is an example of a revealed preference approach, which postulates that the price of a commodity is related to its characteristics. Therefore, variations in demand for a commodity (such as a house) can be statistically related to its attributes (e.g. local air quality, amenities). The hedonic pricing method is used to estimate the value of environmental amenities that affect the prices of marketed goods. Most applications use residential housing prices to estimate the value of environmental amenities. This method is based on the assumption that people value the characteristics of a commodity, or the services it provides, rather than the commodity itself. Thus, prices will reflect the value of a set of characteristics, including environmental characteristics, that people consider important when purchasing the commodity. Property prices can, therefore, be used to estimate local shadow prices for environmental characteristics even though those characteristics are not traded directly.

2. Summary of the papers

2.1 Paper I: Estimating national economic parameters for Namibia

In the first paper of this thesis, shadow prices of capital, labour and foreign exchange for the Namibian economy are estimated. Although the use of shadow prices is essential for sound developmental planning, the application of shadow pricing in Namibia has been limited or virtually non-existent. The interest in deriving Namibian shadow prices arises from both practical and academic points of view.

In practical terms, recognising the need for large-scale investments to drive economic growth prompts the need to apply shadow prices, in order to ensure scarce resources are optimally

allocated. From an academic point of view, the Namibian economy exhibits special features that support the need to estimate national parameters. A highly uneven income distribution, a large informal economy, and minimum wages in certain sectors all validate the necessity of estimating shadow wage rates. Unlike most other developing countries, Namibia is a net capital exporter. Although the economy has high domestic savings, the lack of domestic investment opportunities leads to a capital outflow amounting to 10% of GDP annually. The shadow price of capital can then be reasonably expected to be low. Finally, Namibia's membership of the Southern African Customs Union (SACU) and the Common Monetary Area (CMA) might affect the estimation of the shadow price of foreign exchange in Namibia. SACU groups together Botswana, Lesotho, Namibia, Swaziland (known as the *BLNS countries*) and South Africa, and applies a common external tariff. The SACU Agreement has recently been renegotiated, with key elements revised and given a new focus, in the light of the need to allow BLNS countries greater say in the determination and administration of SACU tariffs. The CMA comprises SACU countries, excluding Botswana, and is a monetary area with a centralised monetary policy aimed at achieving greater financial stability for the southern African region. The monetary policy is controlled by South Africa, and all other CMA currencies are pegged to the South African Rand.

In principle, there should be two Shadow Exchange Rates (SERs): one for convertible currency external to the CMA, and one for Rand-based currencies, which would have a shadow exchange rate of 1 since there are no trade restrictions between CMA countries. The SER calculated in this paper is applicable to transactions with countries outside the CMA, but not to the foreign content of goods purchased from South Africa.

The results suggest that the economic opportunity cost of capital is 7.2% in Namibia. The economic costs of Namibian labour, as a share of financial costs, are 32% for urban semi- and unskilled labour, and 54% for rural semi- and unskilled labour. The economic cost of foreign labour, as a share of financial costs, is 59%. The estimated shadow exchange rate factor is 4% for the Namibian economy.

2.2 Paper II: Estimating Namibian shadow prices within a semi-input–output framework

The purpose of Paper II is to estimate the sectoral shadow prices (Accounting Price Ratios, or APRs) at the national level, using the Semi-Input–Output (SIO) Technique. In contrast to estimates of shadow prices in Paper I, which are limited to a few aggregate shadow prices for capital, labour and foreign exchange, the application of an SIO analysis in Paper II permits the calculation of more shadow prices for the Namibian economy. Utilising the SIO analysis, one is able to (Schohl 1979) –

- readily derive shadow prices for many different sectors of the economy, and
- include the direct and indirect effects of protection on the conversion factors of typically non-traded goods and services.

This larger set of APRs is beneficial for project analysis within sectoral projects and, at the same time, should improve overall appraisal results. In general, the APRs for tradables and non-tradables are expected to fall within the range close to unity or less than unity, respectively. The following table summarises results from the estimations:

Table 1: APR estimates for economic sectors, Namibia

Economic sectors			
1. Tradables	APR	2. Non-tradables	APR
Commercial Agriculture – Cereal	0.87	Traditional agriculture	0.66
Commercial Agriculture – Other crops	0.91	Electricity	0.88
Commercial Agriculture – Animal products	0.97	Water	1.13
Fishing	1.00	Trade and repairs	0.53
Mining	1.00	Hotels and restaurants	0.50
Meat processing	1.00	Communications	0.95
Fish processing	1.00	Finance and insurance	0.62
Grain milling	0.91	Other private services	0.84
Beverages and other food processing	0.85	Government services	0.95
Textiles	0.85		
Light manufacturing	0.95		
Heavy manufacturing	0.87		
Construction	1.00		
Transport	1.00		
Market – Real estate and business services	1.00		
Tourism – Non-residents	1.00		
Petroleum products	0.90		

The results shows that most tradable sectors such as fishing and mining have APRs equal to or closer to 1, with deviations explained by import tariffs. The APRs for non-tradable sectors exhibit greater variation, with the water sector having the highest – reflecting the scarcity of water.

2.3 Paper III: Integration and volatility spillovers in African equity markets: Evidence from Namibia and South Africa

The third paper examines the integration between the Namibian Stock Exchange (NSX) and the Johannesburg Stock Exchange (JSE). The study uses daily stock data to analyse returns and volatility between the two equity markets. The methodology employed consists of unit root tests, cointegration analysis, and volatility modelling. The strong economic and historical ties between South Africa and Namibia from the apartheid era suggest that there should be strong integration. Indeed, previous empirical work reports strong integration between Namibian and South African equity markets.

The paper differs from previous empirical work in that it focuses on the local Namibian index, which does not contain dual-listed stocks. Dual-listed stocks are listed on both the JSE and NSX, where they will expectedly have the same returns and volatility on both exchanges. However, it is not necessarily the case that stocks that are only listed on the NSX will also be highly correlated with stocks on the JSE. Thus, the paper examines integration between the local NSX index and the JSE index. The sample covers the period from 4 January 1999 to 20 March 2003.

The results show that, when dual-listed stocks are excluded, the two markets exhibit very low correlations, and no evidence of a linear relationship could be found between the two equity markets. Moreover, volatility analysis does not provide any evidence of volatility spillover from the JSE to the local NSX. The results suggest that the Namibian local equity index can be a risk diversification tool for regional portfolio diversification in southern Africa.

The constraints of not having within-day-trading data from the NSX hamper the further investigations of aspects of simultaneity in the returns. The availability of within-day-trading data would have permitted the analysis of whether there are unidirectional causations within the day between the two stock markets. Brännäs et al (2007) mention that simultaneity is most likely to arise in closely related markets due to geographic proximity, common institutional set up and the presence of large common traders. The presence of dual listed stocks on both the JSE and NSX is an additional reason to expect simultaneity. Further extension of this work might, in addition to investigating simultaneity, specify alternative models to the one applied here to investigate volatility in the two markets returns.

2.4 Paper IV: Hedonic pricing in Windhoek townships

The fourth paper attempts to determine whether property prices in several low-income areas of Namibia's capital, Windhoek, are affected either by positive or negative attributes, and applies the hedonic pricing method in this analysis. Hedonic pricing, as previously stated, involves the implicit price of attributes or characteristics of a commodity rather than the price of the commodity itself. Hedonic pricing models are used to infer the demand for attributes of environmental quality, through the analysis of marketed goods whose value partly depends on these attributes. The methodology is generally applied for the valuation of environmental goods, property and water, and the implicit price of attributes and characteristics of marketed goods in general. The general assumptions of such a model are that all the goods or services brought to the market should be clearly visible, and that property values and the implicit price of attributes or characteristics should be treated as a single market. Under these assumptions, the price of any residence can be described as a function of the environmental, structural, and neighbourhood characteristics of the location of the residence in question. The hedonic model

can, thus, give a realistic estimation of the environmental values attached by households to attributes, as model estimates are based on market information.

In this paper, we use property sales data obtained from the City of Windhoek municipality, and apply the hedonic pricing model. Our findings are that – apart from housing quality, access to the central business district, access to marketplaces, and access to transportation – environmental quality has a large impact on property prices. Properties located close to a garbage dump sell at considerable discounts, while properties located close to a combined conservation and recreation area sell at premium prices. The results suggest, therefore, that the hedonic pricing method can be usefully applied when studying township areas in developing countries, and that this can clarify and emphasise the importance of environmental factors that are otherwise frequently neglected in town planning for such settlements.

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