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Public Infrastructure and Private Sector Profitability and Productivity in Mexico

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Microeconometric analysis of Mexican industry shows additional investment in public infrastructure produces only a small increase in output. This suggests that the policy emphasis in Mexico should be on the better upkeep of existing infrastructure to ensure the continuity of public services rather than on new capital investment.

This paper specifies a microeconometric model (a restri ted equilibrium framework) to estimate the impact of investment in public infrastructure on private industrial profitability. Empirical results based on time series data for 34 industries characterize the Mexican industrial structure as having involuntary unemployment, deficient product demand, declining productivity growth, increasing returns to scale, and short-run excess capital capacity. Aggregate technological change over the period studied has been capital using and labor saving.

Both labor and capital are underused in the short run. This disequilibrium has high efficiency costs that may be undermining Mexico's international competitiveness.

The long-run multiplier effect of public infrastructure on output as measured by the output elasticity of public infrastructure is positive but small. Since public infrastructure is also observed to have a small degree of complementarity with both capital and labor, better upkeep of the existing infrastructure would help improve the functioning of labor and product markets in Mexico.

From the private sector's perspective, however, the long-run productivity of private capital is much higher than the productivity of public capital. Therefore, new capital investment in the public sector is not recommended at this time and should be undertaken only to rectify any identified constraints imposed by the inadequacy of infrastructure in the private employment of private factors.

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PUBLIC INFRASTRUCTURE AND PRIVATE SECTOR
PROFITABILITY AND PRODUCTIVITY

Microeconometric Foundations for
Macroeconomic Policies in Mexico

by
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I. INTRODUCTION

The role of public infrastructure as a factor of production in stimulating economic growth and influencing productivity of private businesses is well recognized in economic theory and formed the genesis of the World Bank lending policies since its inception, but empirical literature addressing this question is limited. A number of studies in recent years have attempted to examine the relationship between public spending and private investment (see e.g. Blejer and Khan 1984 and Binswanger, 1988). These studies usually specify a priv⸱⸱ ⸱ investment equation in an accelerator or growth model framework an⸱⸱. ⸱vernment investment with appropriate lag structure enters as a determinant of private investment behavior. The results indicate whether or not there has been a positive relationship between public spending and private investment. Beyond this question and as a guide to public policy, these studies have limited usefullness as they do not yield parameters of interest to public policymakers. For example, these studies have not been able to provide evidence pertaining to the following questions of fundamental interest to public officials:

1. What is the impact of public investment on private sector profitability?

2. What is the desired level of public capital stock from the private sector's perspective?

3. What have been the limiting factors in private output expansion?

4. What are the elasticities of factor substitution, output elasticities of factors, and own price elasticities?

5. What are the returns to scale in the short and long runs?

6. Are optimal levels of fixed factors held in the short run?

7. What are the consequences of inoptimal levels of fixed factors for allocative efficiency?

8. What are the shadow prices of capital and infrastructure? Lance Taylor (1979) has argued that shadow prices must be derived from a model that incorporates the interactions of the industrial sector with the rest of the economy and that in Little-Mirrlees and UNIDO methods for computation of shadow prices, "Too much ratiocination is required to get the prices and too much common sense may be left out." (p. 205).

   What are the rates of return to the industrial sector from its direct and voluntary investment in capital and from its involuntary contributions towards the provision of public infrastructure?

10. What has been happening to total factor productivity growth?

Answers to the above questions are helpful in carrying out both a review of existing public programs for deficit reduction as well as ranking potential investment opportunities. Unfortunately these questions could not be handled in an investment equation framework and require precise description of the cost structure of the industrial sector in the jurisdiction to be studied. A production function approach to these questions would be of limited usefulness as it would yield technical efficiency parameters only and would not be able to handle allocative efficiency questions due to absence of prices. To estimate the cost structure, one is faced with several modelling strategies. Broad choices in this respect include static, dynamic or implicitly dynamic formulations. A static equilibrium framework is easier to implement but is useful only under a special set of circumstances when there are no indivisibilities and rigidities in the system and adjustment is costless and instantaneous. These conditions are unlikely to be fulfilled in any practical economic environment let alone in a developing country. This framework would lead to misleading policy prescriptions if quasi-fixed factors indeed diverge from their static equilibrium levels in the short run. Thus it is

essential that appropriate tests of static equilibrium must precede actual estimation in this framework. For example Berndt and Fuss (1982) argues that total factor productivity growth measures are usually in error because researchers have failed to take into account the impact of divergence of fixed factors from their static equilibrium levels (see also Schankerman and Nadiri 1984). In an explicitly dynamic framework, on the other hand, factor disequilibrium is recognized and adjustment costs are explicitly modelled and an expectation hypothesis is specified. The adjustment costs are usually treated as internal to the firm and a specific cost structure usually of a quadratic form is imposed to make the model mathematically tractable. This framework enables the researcher to trace out the dynamic adjustment path under specified conditions (see Pindyk and Rotemburg 1983). A major limitation of this framework is that if divergence from full equilibrium arises from external factors rather than internal adjustment costs then the specified framework would not be helpful. Furthermore, much is lost in imposing a smooth adjustment cost structure for convexity because it rules out interesting assymmetries arising from market imperfections and institutional constraints. An implicitly dynamic formulation such as the one presented here (hereafter called a restricted equilibrium framework) recognizes these constraints and provides a relatively simple and flexible structure to focus on principal research concerns by sidestepping complicated questions regarding the path of dynamic adjustment. A restricted equilibrium approach recognizes that quasi-fixed factors may diverge from their equilibrium values due to factors which are beyond the control of an individual firm in the short run. Short run optimization in this framework takes place over flexible factors only and is conditional on the given levels of fixed factors, input prices and technology. Adjustment costs are considered external to the

firm in the short run and are not explicitly modeled. This latter approach is more suitable for application in a developing country context such as Mexico where almost all markets are imperfect and the sources of factor disequilibrium are more likely to be external to the firm. Mexican economy is saddled with credit rationi.. . price controls and regulations. In addition, divergence of public infrastructure from the level desired by the industrial sector could not be traced to internal adjustment costs but rather due to external factors. The industrial sector must transmit its preferences pertaining to the desired level of infrastructure indirectly through the political process (see also Dalenberg 1987). Thus the source of divergence in the desired and actual level of public infrastructure is external to an industry and only a restricted equilibrium framework is appropriate in modelling the role of public infrastructure in the production process. The restricted equilibrium framework uses parameter estimates from the restricted variable cost function and derived input demand functions to implicitly trace out the total cost structure in the short and long runs. Thus it is able to provide a complete picture of short run disequilibrium (restricted equilibrium) and long run full equilibrium configurations. The approach, however, is deceptively simple in appearance as its implementation is quite difficult. Often the system of non-linear equations does not converge. Furthermore, in solving for optimal levels of quasi-fixed factors and elasticities, analytical derivatives might be intractable and resort must be taken to numeric solution methods. This study adopts the restricted equilibrium framework to examine questions posed in the introductory paragraphs of this paper.

II. A DISEQUILIBRIUM MODEL OF PRODUCTION

We postulate a model of production with short-run disequilibrium in factor demands due to absence of an instantaneous adjustment mechanism. The instantaneous adjustment mechanism may be hampered by costs of investment and disinvestment, regulatory control and imperfections of credit markets, inoptimal size of public infrastructure and institutional constraints. Since the objective of this paper is to quantify the impact of public infrastructure on private sector productivity, the above mentioned rigidities which are helpful in explaining the current levels and evolution of fixed factors are side-stepped to keep the model tractable. This strategy also enable us to keep the model flexible as no specific structure is imposed on the dynamic adjustment behavior of fixed factors (see also Diewert 1986). A restricted cost function approach has been used recently by Schankerman and Nadiri (1984), Dalenberg (1987), and Morrison (1988) to analyze short and long run factor demands and costs. This paper extends their approach to a description of production technology which incorporates interactions of public and private sectors - as well as technical change.

Consider a model of production with labor (L) and intermediate inputs (M) as flexible factors and private capital (K) and effective (available for use) public infrastructure (G_E) as quasi-fixed factors (Z). Firms optimize over flexible factors and treat quasi-fixed factors, input prices and technology (T) as given. Output (Q) is treated as a random variable. This description of production technology is captured by the following short-run variable cost function [VC(·)]:

(1) $VC = VC(P_L, P_M, Q; K, G_E, T)$

where P_L = price of labor

         P_M = price of intermediate inputs.

It may be noted that in the above formulation, public infrastructure is viewed as an important quasi-fixed input in the production process. The firms have little control over this input in the short run. It exhibits characteristics of an impure public good. Firms pay for the provision and maintenance of public infrastructure through property taxes. licenses fees, levies, income taxes and user charges. They share its use with other firms and consumers. In the long run, however, the firms exercise sufficient influence in the determination of public infrastructure. For example, Downs (1957) argues that producers are more likely to have a greater influence on the level and composition of public infrastructure than consumers (p. 254). The long run influence of firms on the public infrastructure is carried out in a number of ways (see also Dalenberg 1987 and Boadway 1983); These include:

   a. Direct lobbying pressures through canvassing and
      political contributions;

   b. Voting with the Feet. This could be in the form of
      actual behavior or a threat to consider such a move.
      Intense interjurisdictional competition for tax bases
      ensures that such threats are not taken lightly; and

   c. Several channels of indirect influence also ensures that
      industry preferences are taken into consideration in the
      determination of public infrastructure. For example, it
      is generally perceived that the level of local
      employment and public services quality depends upon the
      profitability of local business. If public
      infrastructure is perceived by median voter to influence

> business profitability in a positive fashion, then he is
> likely to choose the level of public infrastructure that
> maximizes producer welfare. Furthermore, most
> politicians recognize the health of the local economy is
> an important factor in their re-election campaign. Thus
> they must work to provide the level of infrastructure
> desired by the commercial-industrial sector.

An important qualification to the above points is in order here. Public infrastructure competes with social spending and the choice of the latter will be favored especially if there is anti-business sentiment as may be the case in much of Mexico (except for the North).

(2) and $G_E - G \cdot (I)^\theta$

where   G — Public Infrastructure

   I — Index of use

   θ — A parameter indicating degree of publicness of public infrastructure

The estimated value of θ will indicate how public infrastructure is viewed in terms of its "publicness". A value of 0 would indicate it is a pure public good and a value of 1, on the other hand, would suggest that it is a private good.

The function $VC(\cdot)$ is assumed to be monotonically non-decreasing and concave in P_L and P_M, non-decreasing in Q and non-increasing and convex in K, G and T.

By Shephard's lemma, conditional demands for variable factors would be represented by the following:

(3) $\quad \dfrac{\partial VC}{\partial P_L} - VC_{P_L} (P_L, P_M, Q; K, G_E, T) - L$

and similarly

(4) $\quad \dfrac{\partial VC}{\partial P_M} - VC_{P_M} (P_L, P_M, Q; K, G_E, T) - M$

The associated short-run cost function would be represented by

(5) $\quad SC - VC(\cdot) + P_K \cdot K + P_G \cdot G_E$

$\quad P_K -$ user cost (service price) of private capital.

$\quad P_G -$ user cost of public infrastructure.

The envelope conditions specify static equilibrium levels of quasi-fixed factors (K,G) as follows:

(6) $\quad - VC_K (P_L, P_M, Q; \overset{*}{K}, \overset{*}{G}_E, T) - P_K$

(7) $\quad - VC_G (P_L, P_M, Q; \overset{*}{K}, \overset{*}{G}_E, T) - P_G$

The above conditions state that a static equilibrium is obtained when savings in variable costs from the employment of last unit of a fixed factor just equals its rental rate. Note that $-VC_G$ represents the shadow price of public infrastructure or revealed implicit price or marginal willingness to pay for such service by a private producer. P_G, on the other hand, is a calculated service price of public infrastructure. This

latter price is based on the acquisition price of public infrastructure, opportunity cost of funds and depreciation. Conditions (6) and (7) also guarantee that $\frac{\partial SC}{\partial K}$ and $\frac{\partial SC}{\partial G}$ equal zero when $K = \overset{*}{K}$ and $G_E = \overset{*}{G}_E$.

The envelope conditions imply the following demand functions for fixed factors.

(8) $\overset{*}{K} = K(Q, P_L, P_M, P_K, P_G, T)$

(9) $\overset{*}{G}_E = G_E (Q, P_L, P_M, P_K, P_G, T)$

Thus the long-run cost function could be represented by

(10) $C = VC[Q, P_L, P_M, \overset{*}{K}(\cdot), \overset{*}{G}(\cdot)] + P_K \cdot \overset{*}{K} + P_G \cdot \overset{*}{G}_E$

$= C(Q, P_L, P_M, P_K, P_G, T)$

The duality between production and cost functions ensures that the structure of production can be completely represented by the restricted cost function specified in equation (1). The following sections specify an empirical framework to estimate the restricted cost function, carry out tests of static equilibrium, estimate elasticities of substitution both in the short and long run and present estimates on the rates of return to fixed factors. An analysis of short run productivity growth is also presented.

III. MODEL SPECIFICATION

The model is specified in full translog form because of its flexibility in functional form and its demonstrated superiority over alternate functional forms in Monte Carlo studies (see Guilkey et al 1983). A translog restricted variable cost function treating labor (L) and intermediate inputs (M) as flexible factors (i, j=1...n = L, M) and capital (K) and public infrastructure (G) as quasi-fixed factors, Z (i, j=1...m = K, G) is specified below:

$$(11) \quad \ln VC = \alpha_0 + \sum_i^n \alpha_i \ln P_i + \sum_{i=1}^m \beta_i \ln Z_i + \beta_G \theta \cdot \ln I + \alpha_Q \ln Q$$

$$+ 0.5 \ \gamma_{QQ}(\ln Q)^2 + 0.5 \ \sum_i^n \sum_j^n \gamma_{ij} \ln P_i \ln P_j + 0.5 \ \sum_i^m \sum_j^m \delta_{ij} \ln Z_i \ln Z_j$$

$$+ 0.5 \ \delta_{GG} \ \theta^2 (\ln I)^2 + \sum_{j=1}^m \delta_{jG} \cdot \theta \cdot \ln Z_j \ln I$$

$$+ \sum_i^n \rho_{Qi} \ln Q \ln P_i + \sum_i^n \sum_j^m \rho_{ij} \ln P_i \ln Z_i + \sum_{i=1}^n \rho_{iG} \cdot \theta \cdot \ln P_i \ln I$$

$$+ \sum_i^m \pi_{iQ} \ln Q \ln Z_i + \pi_{GQ} \cdot \theta \cdot \ln Q \cdot \ln I$$

$$+ \phi_T T + \frac{1}{2} \phi_{TT} T^2 + \phi_{TQ} T \ln Q + \sum_i \phi_{TP_i} T \ln P_i$$

$$+ \sum_i^m \phi_{TZ_i} T \ln Z_i + \phi_{TG} \theta \cdot T \cdot \ln I + \epsilon_{VC}$$

Cost minimizing derived demand equations for flexible inputs are obtained from (8) by logarithmically differentiating this function with respect to flexible input prices and applying Shephard's lamma (1953), i.e. $\frac{\partial VC}{\partial P_i} = X_i$.

The derived demand equations obtained from this process can be written as:

$$(12) \quad \partial \ln VC/\partial \ln P_i = \frac{P_i X_i}{\sum\limits_i P_i X_i} = S_i = \alpha_i + \rho_{Qi} \ln Q + \sum\limits_j^n \gamma_{ij} \ln P_j$$

$$+ \sum\limits_j^m \rho_{ij} \ln Z_j + \rho_{iG} \cdot \theta \cdot \ln I + \phi_{TP_i} T + \epsilon_i, \quad V_i$$

Given the translog variable cost function specified in equation (11), the envelope conditions specified in equations (6) and (7) could be written as follows:

$$(13) \quad P_K + (e^{\ln VC}/K) \cdot (\beta_K + \delta_{KK} \ln K + \rho_{LK} \ln P_L$$

$$+ \rho_{MK} \ln P_M + \delta_{KG} \ln G + \delta_{KG} \cdot \theta \cdot \ln I$$

$$+ \pi_{KQ} \cdot \ln Q + \phi_{KT} T) = 0$$

$$(14) \quad P_G + (e^{\ln VC}/G) \cdot (\beta_G + \rho_{LG} \cdot \ln P_L + \rho_{MG} \cdot \ln P_M$$

$$+ \delta_{KG} \cdot \ln K + \delta_{GG} \ln G + \delta_{GG} \cdot \theta \cdot \ln I$$

$$+ \pi_{GQ} \cdot \ln Q + \phi_{GT} \cdot T) = 0$$

RESTRICTIONS

A "well-behaved" cost function must satisfy the following conditions:

(a) **Hicks-Samualson Symmetry Conditions**: This condition ensures that the cross-partial derivatives are equal.

$$\gamma_{ij} = \gamma_{ji} \quad \text{Slutsky Symmetry}$$

and $\quad \delta_{ij} = \delta_{ji}$

(b) **Monotonicity**: The function must be an increasing function of input prices i.e.

$$\frac{\partial \log VC}{\partial \log P_i} \geq 0$$

This condition cannot be imposed but must be satisfied by the estimated function.

(c) **Linear homogeniety conditions for input prices** i.e. when all factor prices are doubled, the total cost will double. It can be shown that linear price homogeneity implies the following restrictions (see Brown and Christenson, 1981 and Eakin and Kneisner, 1988).

$$(15) \quad \sum_{i}^{n} \alpha_i = 1 \qquad \text{where } i = P_L, P_M$$

$$\sum_{i}^{n} \gamma_{ij} = \sum_{i}^{n} \gamma_{ji} = \sum_{i}^{n} \rho_{Qi} = \sum_{i}^{n} \rho_{ij} = \sum_{i}^{n} \phi_{TP_i} = 0, \; \forall_j$$

(d) Other assumptions usually employed by empirical studies include:

   Homotheticity: This restriction is imposed to ensure separability of factor prices and output in a cost function and that optimal factor combination is independent of the scale of output. A homothetic production function has a linear expansion path.

   Homogeniety: This condition implies that elasticity of cost with respect to output is a constant (equal to one for constant returns to scale).

   Neut al Technical Change: This implies that technical change does not affect factor intensity.

The above restrictions are usually imposed for simplicity and tractability but they severely limit the usefulness of the model results for policy analysis. The restrictions associated with homotheticity, homogeneity and neutral technical change are not imposed in this study.

IV. THE DATA

The data on wages, employment, value added and private capital for 34 industries for the period 1970-1983 are obtained from Jarque (1988). In addition aggregate data on public capital stock in electricity, communications and transportation sectors are extracted from the same source. These series are supplemented by data on output, intermediate inputs and prices from various government publications. Index of use is defined as a specific industry's output divided by the gross output of all industries. Implicit price indices for labor, capital and intermediate inputs are constructed using industry-specific constant and current value cost series. Divisia price and quantity indices (see Diewert 1976) for aggregate public capital stock are then computed using price and quantity

series mentioned above. User cost of capital and infrastructure series are developed. Details on the data and the formulae used are available from the author upon request.

V. MODEL PROCEDURES AND RESULTS

An investigation into divergence of quasi-fixed factors from their static equilibrium levels is of critical importance in model selection and interpretation of results. For this purpose an econometric test developed by Schankerman and Nadiri (1984), (see also Hausman, 1981 and Holly, 1982), is utilized. An intuitive basis for this test is presented in the following paragraph.

An Econometric Test of Divergence of Quasi-Fixed Factors From Their Static Equilibrium Values.

Consider β_0 as a vector of parameter estimates obtained from the variable cost function alone and β_1 and β_2 as parameter estimates based on the derived demand functions for flexible and quasi-fixed inputs. Under the null hypothesis both β_1 and β_2 would form a subset of coefficient estimates represented in β_0. Partition β_0 as β_0^0 i.e. the parameters appearing in VC($\cdot$) only and β_2^0 as those appearing in quasi-fixed input demand functions. In a restricted equilibrium framework, the maintained hypothesis (H_0) is that $\beta_2 - \beta_2^0$. A constrained estimate of the system of equations (11) - (14) say $\hat{\beta}$ is consistent under H_0 but not under an alternate hypothesis (H_1) whereas an unconstrained estimator of the system say $\bar{\beta}$ is consistent under both H_0 and H_1. The standard test compares log-likelihood function under $\hat{\beta}$ and $\bar{\beta}$. The standard likelihood ratio test, however, breaks down if one or more regressors appear only in the quasi-

fixed input demand functions i.e. the levels of quasi-fixed factors are influenced by some external factors not represented in the $VC(\cdot)$ formulation. If this were to happen the unconstrained estimator would be inconsistent as equations (13) and (14) would be misspecified under the alternative hypothesis and this misspecification manifests itself through the covariance of the error terms used in the estimation of $\tilde{\beta}$. A proper test, therefore, should compare asymptomatically efficient constrained estimator, $\hat{\beta}$ from the full system (equations (11) to (14)) under the restriction that $\beta_2 = \beta_2^0$ to another unconstrained estimator, $\tilde{\beta}$ from a system of equations that includes variable cost and flexible input demand equations only. Note that $\tilde{\beta}$ is consistent with both H_0 and H_1 whereas $\hat{\beta}$ is consistent under H_0 only. This test can be carried out by computing Λ statistics as follows:

$$(16) \qquad \Lambda = (\tilde{\beta} - \hat{\beta})' \; [COV(\tilde{\beta}) - COV(\hat{\beta})]^{-1} \; (\tilde{\beta} - \hat{\beta})$$

Λ is a chi-square deviate with degrees of freedom being equal to the number of restrictions embodied in $\beta_2 = \beta_2^0$. Tests of divergence of all fixed factors from their static equilibrium values involve comparing the computed value of Λ with the tabulated value of chi-square with K degrees of freedom. Testing for all fixed factors, the computed value of Λ greatly exceeds the tabulated value of $\chi^2_{.05}$ with 14 degrees of freedom. Therefore the null hypothesis that divergence of fixed factors from their static equilibrium levels is due to random variations only is strongly rejected. Two further tests are then carried out to see if only the subsets of K or G are at their optimal values.

In these cases, the coefficient vector $\tilde{\beta}$ is defined as before but $\hat{\beta}$ is obtained equations (11) - (12) plus the subset of (13) and (14)

corresponding to fixed factors being tested. Table 1 presents the test statistics which suggest that whereas the hypothesis that capital is close to its static equilibrium level is strongly rejected, divergence of infrastructure from its static equilibrium level is considered simply as a random variation.

Estimation

The full translog model specified in equations (11) - (12) and (14) is estimated using Gauss-Newton methods (see Judge et. al 1985 pp. 951-974 for details). Equation (13) was excluded due to tests described earlier. Note that the constant returns to scale or homotheticity restrictions are not imposed in the specified system. Symmetry and price homogeneity conditions, on the other hand, are imposed. Price homogeneity condition ensures that if all input prices were to double, cost would double holding all fixed inputs and output constant. Imposition of these restrictions meant that out of 36 coefficients in the system, only 22 were independent. Public infrastructure specification makes the system of equations non-linear in parameters. Furthermore, it is likely that error terms across equations will be correlated. Thus a non-linear estimation method which incorporates corrections for heteroskedasticity would be appropriate. Davidson-Fletcher-Powell algorithm meets these criteria and is employed here. A convergence criterion of .00001 is specified. The algorithm uses an iterative process to maximize the log-likelihood function. Parameter estimates are presented in Table 2. The estimated $VC(\cdot)$ satisfies the theoretical conditions that it be monotonically non-decreasing and concave in P_L and P_M, non-decreasing in Q and non-increasing and convex in K, G and T. Increases in both the

Table 1:

HAUSMAN-HOLLY-SCHANKERMAN-NADIRI TESTS FOR STATIC
EQUILIBRIUM OF QUASI-FIXED FACTORS IN MEXICAN INDUSTRIES

Hypothesis	Λ-Statistic	Degrees of Freedom	Critical $\chi^2_{.05}$	Results
Both Capital and Public Infrastructure at static equilibrium levels	2364.6	14	23.7	Strongly Rejected
Capital only at static equilibrium level	1711.2	7	14.1	Strongly Rejected
Public Infrastructure at static equilibrium level	10.3	7	14.1	Accepted

Notes: Please note that the test allows for random errors in the determination of static equilibrium values.

<u>Table 2:</u>

ESTIMATED PARAMETERS FOR THE NON-LINEAR SYSTEM
OF SIMULTANEOUS EQUATIONS
(476 observations)

Coefficient	Estimated Value	T-Ratio
α_O	.098342	2.0
α_L	.338280	11.6
β_K	-.087747	-3.4
β_G	-.038984	-5.1
α_Q	.833540	28.5
γ_{QQ}	.020939	0.6
γ_{LL}	-.001054	-0.03
δ_{GG}	.068149	2.4
δ_{KK}	.005201	0.9
δ_{KG}	-.002671	-1.5
ρ_{LQ}	.032266	3.0
ρ_{LK}	.012689	1.8
ρ_{LG}	-.005241	-0.7
π_{KQ}	-.072449	-6.4
π_{GQ}	.054220	1.9
ϕ_T	-.222330	-2.5
ϕ_{TT}	.234580	2.8
ϕ_{TQ}	.100910	4.7
ϕ_{TP_L}	-.038736	-1.4
ϕ_{TK}	.039011	1.9
ϕ_{TG}	-.004796	-0.7
THETA	.995000	39.3

Log - Likelihood Function = 1243.989

quasi-fixed factors reduce variable costs of the industry ($\beta_K < 0$, $\beta_G < 0$) with additions to capital having a larger impact than that from increases in the stock of infrastructure ($\beta_K > \beta_G$). The estimated value of θ, the degree of publicness of public infrastructure parameter is statistically significant and is close to unity indicating that public infrastructure is viewed more like a private good or a "congested" public good with the industry bearing full costs of the part of the network it uses. Parameter estimates further suggest that the technological change in Mexico over the period studied has been labor and infrastructure saving ($\phi_{TP_L} < 0$, $\phi_{TG} < 0$) and capital using ($\phi_{TK} > 0$) variety.

Parameter estimates in Table 2 are utilized to estimate the implied static equilibrium levels of capital and infrastructure which in turn are used to retrieve Allen elasticities of substitution (measures of the curvature of the production isoquant and hence pairwise substitutability of inputs while holding output constant), price elasticities of demand and other characteristics of the long run cost function (see Brown & Christensen 1981 and Schankerman and Nadiri, 1984 for details of the elasticity formulae).

The elasticities of substitution estimates presented in Table 3 suggest that there are substantial opportunities for factor substitution both in the short and long runs. These estimates imply that labor, intermediate inputs and capital are competitive (rivals in demand) factors both in the short and long runs. Public infrastructure on the other hand shows a weakly competitive relation with intermediate inputs (in both runs) and weak complementarity with labor (in both runs) and capital (in the long run only). Labor shows a slightly higher degree of complementarity with

Table 3:

ALLEN ELASTICITIES OF SUBSTITUTION (AES)
IN RESTRICTED AND FULL EQUILIBRIUM
(asmptotic standard errors in parentheses)

	Restricted Equilibrium				Full Equilibrium	
	Partial AES at Z $(\sigma_{ij})^P$		Partial AES at Z^* $(\sigma_{ij}^*)^P$		Full AES $(\sigma_{ij})^F$	
σ_{LL}	-1.965	(0.391)	-2.432	(0.241)	-2.634	(0.435)
σ_{MM}	-0.509	(0.072)	-0.564	(0.083)	-0.905	(0.113)
σ_{LM}	1.005	(0.167)	1.021	(0.077)	0.965	(0.222)
σ_{LK}			0.822	(0.145)	0.833	(0.123)
σ_{LG}			-0.373	(0.758)	-0.305	(0.297)
σ_{MK}			0.933	(0.060)	1.128	(0.062)
σ_{MG}			0.194	(0.314)	0.594	(0.151)
σ_{KK}					-2.209	(0.190)
σ_{GG}					-1.758	(7.875)
σ_{GK}					-0.127	(0.094)

$$(\sigma_{ij})^P \bigg|_{Z=Z^0} = \frac{\hat{VC} \cdot VC_{ij}}{VC_i \cdot VC_j} \qquad \text{iff } i, j \in \text{Variable Factors} \atop \text{zero otherwise}$$

$$(\sigma_{ij}^*)^P \bigg|_{Z=Z^*} = \frac{\hat{VC} \cdot VC_{ij}}{VC_i \cdot VC_j} \qquad \text{iff } i \in \text{Variable Factor} \atop \text{zero otherwise}$$

$$(\sigma_{ij})^F = \frac{\hat{C} \cdot C_{ij}}{C_i \cdot C_j}$$

the infrastructure in the short run as opposed to the long run. This result may be due to the fact that a certain minimum level of infrastructure is absolutely vital to employment generation in the private sector.

Table 4 presents estimates of conditional own and cross price elasticities of factor demands. Estimates indicate that labor and intermediate inputs are more responsive to factor price changes than capital and infrastructure. Cross price elasticities of private factors (L, M and K) with the public factor (G) are very small. The estimated own price elasticities confirm "le Chatelier Principle" which states that own price response of variable factors should decrease in absolute value with the increase in the number of factors that are quasi-fixed. Short run own price elasticities of flexible factors are smaller in magnitude than comparable long run values.

Scale Economies and Productivity Growth

Several useful measures that characterize the cost structure of the Mexican industries are presented in Table 5. These parameters suggest that the short run cost elasticity is smaller than the long run cost elasticity. This is consistent with earlier findings that in the short run excess levels of quasi-fixed factors are being held. Note that under a static equilibrium framework, short run cost elasticity is always equal to the long run cost elasticity. Thus a static equilibrium framework would overstate scale economies in the long run in the presence of excess capacity in the short-run. The production structure exhibits increasing return to scale both in the short and long runs. Long run productivity of

Table 4:

SHORT AND LONG RUN CONDITIONAL (PARTIAL) OWN AND CR⁻'S PRICE ELASTICITIES OF FACTOR DEMANDS
(asymptotic standard errors in parentheses)

	Short Run Restricted Equilibrium				Long Run Full Equilibrium	
	$\eta^P_{ij}\big|_{Z=Z^C}$		$\eta^P_{ij}\big|_{Z=Z^*}$		η^F_{ij}	
η_{LL}	-0.472	(0.146)	-0.637	(0.150)	-0.711	(0.117)
η_{MM}	-0.234	(0.076)	-0.299	(0.062)	-0.480	(0.060)
η_{LM}	0.462	(0.146)	0.541	(0.150)	0.442	(0.117)
η_{ML}	0.241	(0.076)	0.276	(0.062)	0.260	(0.060)
η_{LK}			0.132	(0.032)	0.133	(0.020)
η_{LG}			-0.015	(0.023)	-0.012	(0.012)
η_{MK}			0.149	(0.013)	0.181	(0.010)
η_{MG}			0.008	(0.009)	0.024	(0.006ʻ
η_{KL}					0.225	(0.033)
η_{GL}					-0.082	(0.080)
η_{KM}					0.598	(0.132)
η_{GM}					0.314	(0.080)
η_{GK}					-0.020	(0.015)
η_{KG}					-0.005	(0.004)
η_{KK}					-0.353	(0.030)
η_{GG}					-0.070	(0.315)

$$\eta^P_{ij}\big|_{Z=Z^0} = (\sigma_{ij})^P \cdot s_j$$

$$\eta^P_{ij}\big|_{Z=Z^*} = (\sigma^*_{ij})^P \cdot s_j$$

$$\eta^F_{ij} = (\sigma_{ij})^F \cdot s_j$$

Table 5:

**COST AND OUTPUT ELASTICITIES AND SCALE ECONOMIES
IMPLIED BY THE NON-MINIMUM COST FUNCTION
(asymptotic standard errors in parentheses)**

Parameter		Estimate	
Output Elasticity (long-run) of:			
Public Infrastructure	(ϵ_{QG})	.035	(0.012)
Physical Capital	(ϵ_{QK})	.254	(0.006)
Cost Elasticity:			
Short Run	(ϵ_{CQ}^{sr})	0.692	(0.060)
Long Run	(ϵ_{CQ}^{lr})	0.861	(0.028)
Slope of the Average Cost Curve:			
Short Run	(Ω^{sr})	-.308	
Long Run	(Ω^{lr})	-.139	
Scale Economies			
Short Run	$(SCE)^{sr}$	1.445	
Long Run	$(SCE)^{lr}$	1.161	
Short Run Productivity Growth:			
PGQ		-0.01310	
PGX		-0.01121	
PGX-G		-0.01168	

Notes:

$$\epsilon_{CQ}^{sr} = \frac{\partial \ln SC}{\partial \ln Q}, \quad \epsilon_{CQ}^{lr} = \frac{\partial \ln C}{\partial \ln Q}, \quad \Omega^{sr} = (\epsilon_{CQ}^{sr} - 1) \quad \Omega^{lr} = (\epsilon_{CQ}^{lr} - 1)$$

$$\epsilon_{QG} = \frac{\partial Q}{\partial G} \cdot \frac{G}{Q}, \quad \epsilon_{QK} = \frac{\partial Q}{\partial K} \cdot \frac{K}{Q}, \quad (SCE)^{sr} = (\epsilon_{CQ}^{sr})^{-1}, \quad (SCE)^{lr} = (\epsilon_{CQ}^{lr})^{-1}$$

capital in private production is estimated to be much higher than the productivity of public infrastructure. Finally, short-run measures of productivity growth show a declining trend over the period studied. PGQ indicates the rate at which output grows over time holding all inputs constant. It is defined as follows (see Callan 1988):

$$(17) \qquad PGQ = -(\frac{\partial lnVC}{\partial T})/(\frac{\partial lnVC}{\partial lnQ})$$

This measure shows an average annual decline of 1.3% in productivity growth. A related measure, PGX, measures the common rate at which all inputs can be reduced while holding output constant and is defined as:

$$(18) \qquad PGX = -(\frac{\partial lnVC}{\partial T})/[1 - \Sigma(\frac{\partial lnVC}{\partial lnZ})]$$

Short run productivity growth indicated by this measure shows an average annual decline of 1.1%. A third measure, PGX-G, assumes that the marginal impact of public infrastructure on the variable costs of the industry is equal to zero and then estimates the common rate at which all inputs can be reduced while holding output constant. Mathematically,

$$(19) \qquad PGX-G = -(\frac{\partial lnVC}{\partial T})/[1 - (\frac{\partial lnVC}{\partial lnK})]$$

This measure shows an average annual decline of 1.2% in short run productivity growth.

Disequilibrium in Factor Demands and Allocative Efficiency

Parameter estimates of the restricted variable cost function are used to retrieve static equilibrium values of K and G. These estimates suggest that excess stocks of capital and infrastructure are held by the Mexican industries. Capital and infrastructure diverge from their equilibrium values by 32.0 and 8.6 percent respectively. Excess capacity in infrastructure is not statistically significant and its divergence from its desired level is due to random variations only. The findings of excess capacity in fixed factors are further collaborated by estimates of shadow prices of capital and infrastructure yielded by the variable cost function. Shadow price of a fixed factor is defined as reductions in variable costs resulting from an addition of one unit of the fixed factor. Table 6 relates shadow prices of capital and infrastructure to their service prices (user cost) and also to real interest rate. Factors would be at their static equilibrium values if the shadow price of a fixed factor equals its service price i.e. marginal cost equals savings in variable costs. The shadow price of capital and infrastructure are estimated to be 4.9 and 4.4 respectively, whereas their service prices are estimated to be 6.7 and 4.6 respectively. Thus the shadow price of capital is significantly lower than its service price giving a clear indication of overinvestment in structure, machinery and equipment. The shadow price of infrastructure on the other hand, though smaller is only slightly lower than its service price. Note that the service price calculations take into consideration factors such as the acquisition price of capital, real discount rate, depreciation rate, income tax rates, indirect taxes, tax credits and subsidies. Table 6 also relates shadow prices of fixed factors to real non-tax cost of borrowing

Table 6:

INDICATORS OF SHORT RUN DISEQUILIBRIUM IN FACTOR DEMANDS AND IMPLIED EFFICIENCY COSTS REVEALED BY THE RESTRICTED VARIABLE COST FUNCTION

Indicator	Estimate	Comments
K/K^*	1.320	32% excess capacity
G/G^*	1.086	8.6% excess capacity. This divergence is due to random variations only and is not statistically significant.
Allocative Inefficiency Index = $\left[\dfrac{(C - C_{min})}{C_{min}} \right]$	0.094	9.4% of total costs are due to in-optimal levels of quasi-fixed factors in the short run.
F_K/P_K	0.731	Additional capital investment would be uneconomic in the short run.
F_K/r	0.555	
F_G/P_G	0.957	Additional infrastructure investment would be warranted only to rectify any identified constraints imposed by the inadequacy of infrastructure in the private employment of private factors.
F_G/r	0.499	

Notations:

Superscript *	:	Static Equilibrium Value
K	:	Physical Capital
G	:	Public Infrastructure
C	:	Total Cost
C_{min}	:	Minimum cost with optimization
F_K	:	Shadow price of capital
F_G	:	Shadow price of public infrastructure
r	:	Real interest rate
P_K	:	Service price of capital
P_G	:	Service price of infrastructure

alone. This comparison shows a dramatic divergence of shadow prices from costs of borrowing.

Finally, the existence of excess factors imply significant efficiency costs for Mexican industries. Allocative inefficiency index presented in Table 6 suggest that on the average 9.4% of total industrial sector costs are due to in-optimal levels of fixed factors being held. Such a large efficiency cost would be detrimental to international competitiveness of Mexico.

Rates of Return to Quasi-Fixed Factors

Table 7 presents estimates of ex-post internal rate of return to quasi-fixed factors implied by the restricted cost functions under varying assumptions regarding the gestation lag between the investment in a fixed factor and its impact on VC(·) and the speed at which output price adjusts towards the new level of average cost. The rates of return to capital and infrastructure presented in Table 7 have been computed as the solution to the following non-linear equation derived by Schankerman and Nadiri (1984):

$$(20) \qquad - \frac{\partial VC}{\partial Z} = e^{\tau \mu} (\mu + \lambda + \psi - g) - e^{\tau r} (\lambda - g)(\frac{r + \psi}{\mu + \psi})$$

where μ =   marginal net (internal) rate of return to investment at time zero (1970).

  r =   gestation lag between the investment and its impact on VC(·).

  g =   rate of growth of output demand.

  λ =   rate of adjustment of output price towards the new level of average cost.

Table 7:

EX-POST INTERNAL RATE OF RETURN TO QUASI-FIXED FACTORS
IMPLIED BY THE RESTRICTED COST FUNCTION

(a) CAPITAL

$\tau \rightarrow$	0	1	2	3	5
$\lambda \downarrow$					
0.25	.057	.058	.060	.061	.063
0.30	.061	.062	.063	.064	.066
0.35	.063	.065	.066	.067	.069
0.40	.066	.067	.068	.069	.071
0.50	.069	.070	.071	.072	.074

(b) PUBLIC INFRASTRUCTURE

$\tau \rightarrow$	0	1	2	3	5
$\lambda \downarrow$					
0.25	.055	.057	.059	.060	.062
0.30	.059	.061	.062	.063	.066
0.35	.062	.064	.065	.066	.068
0.40	.065	.066	.067	.068	.070
0.50	.068	.070	.071	.072	.073

Notes:

τ is the gestation lag between the investment and its impact on VC($\bullet$)
λ output price adjustment towards new level of average cost.
Note that μ varies directly with τ and λ if $\mu < r$ and μ varies inversely with τ
and λ if $\mu > r$.

ψ — rate of depreciation.

r — market interest rate (real).

The left hand side of equation (20) measures the marginal benefit of a unit of investment and the right hand side the marginal cost of such investment taking into consideration discounts for implementation delay, rate of change of output price, capital gains due to the rate of growth of real output, impact delay after investment is in place and opportunity cost of funds. Parameter values used in this estimation are r — 0,1,2,3,5; λ — 0.25,0.30,0.35,0.40,0.50; g — .05 (based on data for 1970-83); ψ — .05; r — .088 (average for the period 1970-83). Table 7 presents estimates of ex-post rates of return to the industrial sector from its direct and voluntary investment in capital and involuntary and indirect investment in infrastructure. Returns to capital vary from 5.7 to 7.4 percent and returns to infrastructure range from 5.5 to 7.3 percent. There are hardly any discernible differences in the two returns and the private sector seems to have earned comparable returns from its investment in physical capital and from its involuntary contributions towards the provision of public infrastructure. Note also that these returns are lower than the opportunity cost of funds thereby reconfirming the excess capacity findings.

VI. PRINCIPAL FINDINGS AND POLICY IMPLICATIONS

The following paragraphs briefly recapitulate the principal findings of this study and discuss their economic significance. These findings are:

1.   The level of public infrastructure in Mexico is close to the level desired by the industrial sector. This suggests that policy emphasis should be on the better upkeep of the existing infrastructure to ensure continuity in the existing level of services rather than new capital investment. Tanzi (1988) has also stressed this point.

2.   Public infrastructure is weakly complementary to both private capital and labor. Labor, capital and intermediate inputs on the other hand, are observed to be competitive factors. Long run multiplier effect of public infrastructure on output as measured by the output elasticity of public infrastructure is positive, significant but very small. These results suggest that better upkeep of the existing infrastructure would have a positive impact on labor and product markets.

3.   Both labor and capital are observed to be underutilized in the short run. Factor demand response to input price changes is seen to be quite limited.

4.   Technical change has been labor saving and capital using variety and productivity growth has shown a declining trend in the short run.

5.   Rates of returns to the industrial sector from its direct and voluntary investment in private capital and its involuntary and indirect investment in public infrastructure have been roughly comparable. An important explanation for this peculiar result has been offered by the excess capital capacity finding discussed later.

6.   Shadow prices of both public and private capital are lower than their service prices in the short run but in the long run productivity of private capital is estimated to be much higher than the productivity of public capital from the private sector's perspective. These results follow from the findings of excess capacity for private capital and a random variation of public infrastructure from its static equilibrium value in the short run.

7.   Short run factor market disequilibrium with excess capital capacity.   In the presence of excess capacity, an increase in investment in fixed factors leads to a decrease in average variable cost but an increase in average total cost.   This is a remarkable finding of this paper.   The notion of excess capital capacity in Mexico has been alluded to by Banco de Mexico (1986b), Levy (1988) and Cardoso and Levy (1988) but without any substantive evidence.   In recent years the Bank of Mexico has conducted surveys of industrial concerns to reflect on this question.   1982 is the earliest year data on installed capacity is available from these surveys. Banco de Mexico (1988) indicates that in the first half of 1982, respondents indicating excess installed capacity outnumbered those indicating deficient capacity by a margin of 33% (see p. 24).   The existence of excess capacity has interesting implications.   In an economy with involuntary unemployment induced by excess capacity, an increase in indirect taxes could lead to a further contraction of aggregate demand through its negative effect on disposable incomes and profits. Furthermore, Poterba, Rotemberg and Summers (1986) have demonstrated that in such a setting a balanced budget shift from direct to indirect taxation leads to a reduction in employment as well as output.   In the presence of excess capacity, export subsidies and selective trade barriers can have a

positive impact on trade balance without inducing inflationary tendencies in the economy. Furthermore, with excess capacity, an increase in public spending is likely to have a positive impact on private output (see Levy 1988, p. 3).

Excess capacity in Mexico might have occurred due to one or more of the following reasons:

a. Subsidies to capital: In equalizing after tax rate of return to investment in various assets firms may overinvest in the subsidized asset. In the presence of tax incentives firms in Mexico might have overinvested in physical capital. Ebrill (1984) shows that the relative cost of capital in Mexico has been lower than many other developing nations.

b. Technical Change: Excess capacity could also occur if the technological change gives some advantage to new capital. In such a case installation of new capacity could take place before the old capital is retired (see Chenery 1952).

c. Regulation: The Mexican economy is highly regulated. Conservative estimates suggest that nearly two-thirds of domestic production is subject to one form or another of bureaucratic controls. These controls take a variety of forms and include price controls, credit rationing, licensing, quantitative restrictions, trade restrictions and exchange controls. A regulatory environment creates strong incentives for firms to seek approvals for plant sizes larger than their short run requirements. This is a natural consequence of high transaction costs associated with bureaucratic approval processes. Larger requests often have a greater chance to qualify for a fast-track approval process. Furthermore, in a controlled price setting, regulatory authorities usually recognize capital as the appropriate base for the allowed rate of return calculations. It therefore pays for a firm to inflate this base to seek a price increase. In the economics of regulation literature, this is commonly known as the Averch-Johnson effect. Excess capacity may also have been an outcome of strategic behavior on the part of some large producers to seek closure of the industry for new investment to retain/create a degree of monopoly power.

d. Sector specific capital: Excess capacity could also occur if the capital was industry specific and large costs were associated with its disinvestment. In such a case excess

capacity in declining industries can coexist with deficient capacity in the growing industries. In Mexico export industries might have inadequate capacity whereas import competing industries might have built excess capacity. Excess capacity may also be the result of a large number of sub-optimal size plants in a given industry. These plants may be underutilized but serious disruption costs associated with disinvestment may prevent replacement of these small plants by a large optimal size plant. These questions needs to be explored in future empirical work on this subject.

e. Scale economies: Scale economies also create incentives for excess capital capacity. At a theoretical level, Weitzman (1982, 1988) shows that increasing returns to scale is synonymous with excess capacity. This happens because indivisibilities to physical and human capital provide incentives to firms to choose a plant size larger than their current or immediately future run requirements. Chenery (1952) also argues that in the presence of economies of scale, excess capacity will occur even with perfect foresight. This will happen if the new vintage capital is relatively more cost effective. The evidence presented in this paper suggests that significant unexploited scale economies exist in the Mexican industries.

f. Trade regime: Overvalued exchange rate, exchange controls, anti-export tariff regime, import controls, tax evasive behavior, and uncertain political and business climate also encourage investment in physical assets to realize capital gains. All the above factors are an important part of most analyses of the performance of the Mexican economy in the seventies and eighties (see Balassa 1985, 1988a, 1988b, Dornbusch 1988, and Cardoso and Levy 1988).

g. Product demand Expectations: Finally and importantly, excess capacity in Mexico might have been the result of buoyant expectations regarding the growth in aggregate demand and these expectations were not realized due to severe strains on the economy caused by servicing a high level of foreign debt. Increases in taxes on consumption, restrictive wage policies, tight monetary policies and dramatic reductions in public investment programs in particular and overall public spending in general to reduce the deficit and service debt might have contributed to aggregate demand contraction in Mexico in the early eighties. Cardoso and Levy (1988) blame severe contraction in aggregate demand induced by the above policies as a source of negative growth, zero net investment, capital flight and falling real wages in Mexico during the period 1982-1985.

8.   Industrial efficiency costs associated with the short run factor market disequilibrium are estimated to be quite high and may be undermining Mexico's international competitiveness.

9.   Increasing returns to scale with higher returns in the short run than in the long run: Higher scale economies in the short run are indicative of short run excess capital capacity. The growth and development literature suggests that increasing returns to scale could be experienced in the initial stages of development. Empirical results presented in this paper are supportive of this proposition. This finding implies that the static equilibrium constant returns to scale paradigm where under Say's law supply creates its own demand would lead to misleading policy conclusions for an economy whose industrial structure conforms to a contradictory paradigm of increasing returns to scale. Note that scale economies that are external to individual firms but internal to an industry are compatible with perfect competition.

Increasing returns to scale is a subject of growing theoretical interest in recent years. There is a greater realization in the academic literature now than it existed less than a decade ago that in the real world scale economies may be a more prevalent phenomenon than is commonly recognized. For example, Weitzman (1982, 1988) demonstrates that the existence of unemployment is inconsistent with constant returns to scale and perfect competition.

Increasing returns to scale has important policy implications. For example, the presence of increasing returns to scale suggests that real wages will behave in a procyclical fashion and the classical argument that

involuntary unemployment will be eliminated by downward pressures on money wages would not hold water. Furthermore, in such an environment, deficiency in aggregate demand manifests itself in lower levels of output being produced at higher per unit costs. Under increasing returns to scale, equal pay for equal work provisions induce a greater reduction in workforce than warranted by the decline in aggregated demand. With increase in demand, higher employment can take place with constant or even rising money wages if there is excess capital capacity. In this latter case, marginal products of labor and capital increase as newly hired workers bring idle machinery into operation (see also Lindbeck and Snower 1988, Blanchard and Kiyotaki, 1987, and Summers 1988). Procyclical behavior of real wages is confirmed by the Mexican data (see Levy 1988 and Dornbusch 1988).

The standard constant returns to scale, perfect competition trade theory result that a home country export subsidy must make the foreign country better off is contradicted when there are scale economies and/or imperfect competition. In the latter case a strong case for a small export subsidy could be made (see Markusen and Melvin 1988, pp. 249-257). Krugman (1984) at a theoretical level shows that when the scale economies are of the nature of dynamic "learning by doing," protected home country domain allows accelerated accumulation of sales experience and marketing know-how and its timely conversion to reduced costs to achieve a competitive edge over foreign competition. Thus the existence of scale economies could imply policy prescriptions which are radically different from the standard

theoretical results in which we have been immersed for a long time. A quote from Blinder (1988) provides a befitting prologue to this discussion. Blinder writes,

> "Thus the difference between the long run equilibrium results that we know and love (and teach to our young) and the short run disequilibrium results that people actually experience are no more quibbles. They may be fundamental. And that may be one reason why our advice so often falls on deaf ears." (p. 12).

References

Balassa, Bela (1985). Change and Challenge in the World Economy. St. Martin's Press, New York.

Balassa, Bela (1988a). "The Interaction of Factor and Product Market Distortions in Developing Countries." World Development, vol. 16, no. 4, pp. 449-463.

Balassa, Bela (1988b). "The Lessons of East Asian Development: An Overview. Economic Development and Cultural Change, pp. S273-S290.

Banco de Mexico, Mexico D.F. (various years). Sistema de Cuertas Nacionales de Mexico.

Banco de Mexico (1986a). "La Encuesta de Acervos, Depreciación y Formación de Capital del Banco de Mexico." Documento Interno, Reporte Methodologico. Dirección de Investigación Económica.

Banco de Mexico (1986b). The Mexican Economy.

Banco de Mexico, Mexico D.F. (1987). Indicadores Economicos.

Banco de Mexico (1988). "Encuesta Semestral de Coyuntura, 2e semestre 1987." Dirección de Investigación Económica Gerencia del Sector Real. Febrero de 1988.

Berndt, E.R. and M.A. Fuss (1982). "Productivity Measurement Using Capital Asset Valuation to Adjust for Variations in Utilization." National Bureau of Economic Research, Working Paper No. 895.

Binswanger, Hans (1988). "The Impact of Infrastructure and Financial Institutions on Agricultural Output and Investment in India." Unpublished Paper.

Blanchard, O.J. and Kiyotaki, N. (1987). "Monopolistic Competition and the Effects of Aggregate Demand." The American Economic Review, vol. 77, no. 4, pp. 647-666.

Blejer, M.I. and M.S. Khan (1984). "Government Policy and Private Investment in Developing Countries", International Monetary Fund Staff Papers, vol. 31, pp. 379-403.

Blinder, Alan S. (1988). "The Challenge of Unemployment", The American Economic Review, vol. 78, No. 2, pp. 1-15.

Boadway, Robin (1983). "Similarities and Differences Between Public Goods and Public Factors.", Public Finance, 28, pp. 245-57.

Brown, Randall S. and Christensen, Laurits R. (1981). "Estimating Elasticities of Substitution in a Model of Partial Static Equilibrium: An Application to U.S. Agriculture, 1947 to 1974.", in Ernst R. Berndt and Barry C. Field, eds., Measuring and Modelling Natural Resource Substitution, Cambridge: MIT Press, Cambridge, pp. 209-29.

Callan, Scott J. (1988). "Productivity, Scale Economics and Technical Change: Reconsidered", Southern Economic Journal, vol. 54, no. 3, pp. 715-724.

Cardoso, Eliana A. and Levy, Santiago (1988). "Mexico". In R. Dornbusch and F. Leslie C.H. Helmers (eds.) The Open Economy: Tools for Policy Making in Developing Countries. Oxford University Press for the World Bank.

Chenery, H.B. (1952). "Overcapacity and the Acceleration Principle". Econometrica, vol. 20, no. 1, pp. 1-28.

Dalenberg, Douglas (1987). "Estimates of Elasticities of Substitution Between Public and Private Inputs in the Manufacturing Sector of Metropolitan Areas." Processed.

Diewert, W.E. (1976). "Exact and Superlative Index Numbers." Journal of Econometrics, 4, pp. 115-145.

Diewert, W.E. (1986). The Measurement of the Economic Benefits of Infrastructure Service, Springer-Verlag, New York.

Dornbusch, R. (1988). "Mexico: Stabilization, Debt and Growth." Processed.

Downs, Anthony (1957). An Economic Theory of Democracy, New York: Harper and Row.

Eakin, B. Kelly and Kniesner, Thomas J. (1988). "Estimating a Non-Minimum Cost Function for Hospitals.", Southern Economic Journal, vol. 54, No. 3, January, pp. 583-597.

Ebrill, L.P. (1984)."Taxes and the Cost of Capital, Some Estimates for Developing Countries." IMF DM84/16. Processed.

Feltenstein, Andrew and Morris, Stephen (1988). "Fiscal Stabilization and Exchange Rate Instability: A Theoretical Approach and Some Policy Conclusions Using Mexican Data." Processed.

Guilkey, David K., Lovell, C.A. Knox and Sickles, Robin (1983). "A Comparison of the Performance of Three Flexible Functional Forms.", International Economic Review, October, 24, pp. 591-616.

Hausman, J.A. (1978). "Specification Tests in Econometrics." Econometrica, 46, pp. 1251-1272.

Holly, A. (1982). "A Remark on Hausman's Specification Test.", Econometrica, 50, pp. 749-759.

International Monetary Fund (various years). <u>International Financial Statistics</u>.

Jarque, Carlos M. (1988). "An Empirical Study of the Determinants of Production in Mexico." Processed.

Krugman, P.R. (1984). "Import Protection as Export Promotion: International Competition in the Presence of Oligopoly and Economies of Scale." In H. Kierzkowski (ed.), <u>Monopolistic Competition in International Trade</u>. Oxford: Oxford University Press.

Levy, Santiago (1988). "Export Subsidies and the Balance of Trade." Forthcoming. <u>Journal of Development Economics</u>.

Lindbeck, Assar and Snower, Dennis J. (1988). "Long Term Unemployment and Macroeconomic Policy." <u>The American Economic Review</u>, vol. 78, no. 2, pp. 38-43.

Markusen, J.R. and Melvin, J.R. (1988). <u>The Theory of International Trade</u>. Harper and Row Publishers, New York.

Morrison, Catherine (1988). "Quasi-Fixed Inputs in U.S. and Japanese Manufacturing: A Generalized Leontief Restricted Cost Function Approach." <u>The Review of Economies and Statistics</u>. pp. 275-287.

Pindyk and Rotemberg, Julio J. (1983). "Dynamic Factor Demands, Energy Use and the Effects of Energy Price Shocks.", <u>American Economic Review</u>, December, 73, pp. 1066-79.

Poterba, J. M., Rotemberg, J.J. and Summers, L.H. (1986). "A Tax-Based Test for Nominal Rigidities". <u>American Economic Review</u>, vol. 76, pp. 659-675.

Schankerman, Mark and Nadiri, M. Ishaq (1984). "Restricted Cost Functions and the Rate of Return to Quasi-Fixed Factors, with an Application to R&D and Capital in the Bell System.", NBER Working Paper No. 1259, January 1984.

Summers, Lawrence H. (1988). "Relative Wages, Efficiency Wages and Keynesian Unemployment." <u>The American Economic Review</u>, vol. 78, no. 2, pp. 383-418.

Tanzi, Vito (1988). "The Role of the Public Sector in the Market Economies of Developing Asia: General Lessons for the Current Debt Strategy." International Monetary Fund Working Paper No. WP/88/7.

Taylor, Lance (1979). <u>Macro Models for Developing Countries</u>. McGraw-Hill, New York.

Weitzman, Martin L. (1982). "Increasing Returns and the Foundations of Unemployment Theory." <u>The Economic Journal</u>, vol. 92, pp. 787-804.

_____ (1988). "Increasing Returns and the Foundation of Unemployment Theory: Rejoinder". <u>The Economic Journal</u>, vol. 98, pp. 172-174.

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