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INDEXING AND MACROECONOMICS:

A SURVEY OF THEORETICAL DEVELOPMENTS

AND INTERNATIONAL EXPERIENCE**

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I. Introduction

More than one decade has elapsed since Miltion Friedman (1974) and Herbert Giersch (1974) called for full indexation as an instrument to promote macroeconomic stability. Since then, indexing has been a subject of continuing controversy in Macroeconomics, both in theoretical developments and in international experience. There have been debates about the "optimal" degree of wage indexing, the proper price indicators to use in a wage adjustment rule, and the relationship of indexing to intervention policies. In Israel, indexing has been accepted as a fact of life, in order to reduce the distortions of high inflation. It has also been blamed for reducing the will to fight inflation. In Brazil, indexing was considered a crucial element in the "success story" of the late 60's and early 70's. After the OPEC shocks and the return of high inflation, however, it is now considered a culprit, and policy-makers have taken steps to reduce it. In Argentina, Chile, and Uruguay, disindexation--a reduction in the degree of indexing of wages and/or exchange rates to inflation--was an explicit phase in the transition from the "old orthodoxy" to the "new orthodoxy" in stabilization policy in the late 70's.

What are the key issues in the continuing controversy over indexing over the past decade? What lessons can one learn from recent theoretical developments and international experiences? Is there an emerging concensus view, despite the continuing controversy? What further research needs to be done, if there is to be a fruitful convergence of theoretical work with historical/empirical analysis? These questions motivate this review survey of the rapidly growing literature on indexation.

Of course, indexing proposals go back to the first decades of the 19th

century by Lowe (1822) and Scrope (1822), and were further developed in the late 19th Century and early twentieth century by Jevons (1884) and Fisher (1922). Fisher acknowledged that the purpose of indexing is not directly related to reducing price level fluctuations, but rather to preventing such fluctuations from inserting a "speculative element into business." [Fisher (1922): p. 335]. However, he saw that an "incidental result" of the indexing system would be that "fluctuations in the level of prices would be less than before" because "credit cycles would no longer be stimulated" in an indexed system, since the "alternative abnormal encouragement and discouragement of loans would cease" [Fisher (1922): p. 335]. With indexing, Fisher thus argued that "credit fluctuations would become less "and the level of prices would be comparatively unaffected by them." [Fisher (1922): p. 335].

Both Friedman and Giersch argued against the "widespread prejudice" that indexing may cause inflation to accelerate, and advocated indexing as a help to stabilizaton policy. Rather than being interpreted as an "act of despair" and as an "indication of willingness to capitulate," indexing is introduced, according to Giersch, in order to "make sure that a monetary policy program aiming at price stability will not be endangered by a worsening of the employment situation or by crises originating in overindebtedness" [Giersch (1974): p. 12]. Denying that indexing will "condemn us to perpetual inflation" Friedman argues that indexing will "temper some of the hardships that now follow from a drop in the rate of inflation" and "will shorten the time it takes for a reduction in the rate of growth of total spending to have its full effect in reducing the rate of inflation" [Friedman (1974): p. 43].

Giersch advocated the repeal of the anti-indexing provisions of the Currency Act of 1948 in West Germany while Friedman put forward specific proposals for tax/asset indexing in the United States in addition to

encouraging wider use of wage escalator clauses in the United States [See Giersch (1974): p. 14 and Friedman (1974): pp. 36-41]. Both Friedman and Giersch presented surveys of indexing procedures in various countries in the 60s and 70s, references to classical writings on economists prior to Fisher, and discussions of indexing in professional journals prior to 1974. Since then, major oil shocks, the experience of floating exchange rates, and trade/capital account liberalization schemes have made the question of indexing considerably more complicated, controversial, and interesting, both in theoretical literature and in the analysis of recent experience.

The second part of this paper concentrates on recent theoretical developments. It is split into two sub-sections, one for closed economy models, the other for open-economy models. The third part reviews recent international experiences. The last section is the conclusion.

II. Theoretical Developments

This part of the review is sub-divided into two sections, on for closed economy models, the other for open-economy models. It will become apparent that the open-economy models generalize and add new analytical dimensions to the closed-economy models. It will also become apparent that the fundamental issues raised by the closed-economy models remain so in the open-economy approaches. Indexing is a macroeconomic policy; its "optimal level" depends on an integrated view of the macroeconomic/international context.

As the literature develops from relatively simple stochastic macro models of a closed economy to more complicated models with wage and exchange rate rules, one cannot help but question the utility of incresing model

complexities. Do these models yield sufficiently new and precise information for indexing policy formulation, which justifies their increasing complexity? In some cases, the answer will be negative. From this review will emerge not only a critique of the models, but also an agenda for alternative model development.

A. Closed-Economy Models

The closed-economy section will first deal with the contributions of small stochastic models, and then assess the broader models which incorporate asset and tax indexing with wage indexing.

Stochastic Models of Wage Indexing

The fundamental models for wage indexing are the Gray (1976) and Fischer (1977) models. These models tell us that the optimal degree of indexing should be less than one if the economy is subject to real productivity and nominal monetary shocks. Gray's result comes from minimization of a loss function, based on the deviation of output under indexing from output in a frictionless economy. Succeeding literature in open and closed-economy models has followed this procedure in assessing indexing policy.

The virtue of this approach is its analytical simplicity. A shortcoming, which these models have in common with wider classes of models of inflation or exchange rate determination, is that the effects of changes in prices, inflation, or other variables on individual utility cannot be determined on the basis of markets in which agents' demand functions are not derived as part of an overall utility maximization. Of course, replacing the loss-function minimization approach with a utility maximization approach for individual

agents would considerably complicate the indexing models, and it is difficult to predict what new results this alternative approach would produce.

The implication of the Gray/Fischer models--that full indexation of wages is destabilizing if the economy is subject to a mix of real and monetary shocks--provides support for disindexation of fully-indexed economies. Cukierman (1980), however, provided one major caveat to the Gray/Fischer approach: if the employment rule is supply-determined, full indexation of wages may actually reduce fluctuations in output in the face of supply shocks.

Blanchard (1979) considered alternative indexing rules. He called the Gray/Fischer rule, where wages are indexed only to the price level, a "restricted rule." This rule emerges when these is a cost to including the relative price of materials in addition to final prices in a wage rule. Blanchard also related wage indexing to activist monetary policy. Such policy increases the gain of using restricted rules, and lowers the degree of indexation necessary for the economy. Blanchard's work generalized the work of Gray and Fischer, drew attention to broader indexing rules, and related the choice of indexing rule and degree of indexing to policy responsiveness. These issues have been especially important in succeeding discussions of indexing in the open-econmy context.

Pazner (1981) and Karni (1983) proposed an unrestricted rule in Blanchard's sense: full indexation of wages to the price level, and partial indexation to real income. Pazner found that this rule neutralizes the real effects of monetary shocks and minimizes the costs of real shocks. Karni showed that this rule, properly specified from knowledge of the structural parameters of the economy, will in fact eliminate any losses due to real shocks. Thus, the Gray "loss function" will be minimized at zero. The problem with the Pazner/Karni approach, of course, is the possible cost of

including income in an indexing rule. Is it easier for the government to reduce the degree of indexing to one variable, the price level, or to include additional variables in the wage rule? Succeeding literature has also proposed extended indexing rules, but few, if any, have compared the marginal costs of including additional variables with the marginal gains from reducing the loss function.

Of course, if one posits an information-based rational expectations equilibrium model, then indexing is irrelevant for output stability, under any type of shock. This is what Barro (1976) did. His "output invariance" result is "independent of the specific form of indexing and the form of the distribution of the stochastic terms" [Barro (1976): p.238]. So it would not matter if the government reduces the degree of indexation in the economy. The only effect will be to reduce price variabilty. From Barro's perspective, then, it is always appear beneficial for the government to reduce indexing, since (1) indexing is ineffective in reducing output variability, (2) there is no need to have indexing to neutralize monetary shocks, and (3) lower indexing will reduce price variability. Barro's work is thus consistent with disindexation policy.

What about an economy subject to recurring monetary shocks? In the original Gray framework, the optimal degree of indexing should be unity. Gray (1983), however, recognized "information confusion" as a possibility: some part of every monetary disturbance will be "mistakenly perceived as a relative demand disturbance" and thus "full indexation of wages will not completely insulate the real sector from monetary disturbances" [Gray (1983): p.25]. Gray's results reinforce the support of previous literature for disindexation. Even in the face of monetary shocks, raising the level of indexation to unity may not help, since some portion of the monetary shocks

will be perceived to be real shocks.

While the results of small stochastic models on wage indexing support a reduction in the degree of indexing, little research has been done on the effect of switching from one rule or government regime which permits full indexation, to another which restricts the degree of indexation in the economy. Will the implementation of a new indexing rule constitute a "non-recurring" shock which initiates a "transition period" when rational expectations give way to time-varing adaptive expectations, as Taylor (1975) suggested, in the context of monetary policy change? If so, it will be difficult to predict what effects the new indexing policies will have on output variability during transition periods, even if output is invariant to indexing rule changes when expectations have fully converged. On the other hand, a change in indexing policy is "news" and an important source of information to economic agents. Can a shift of the wage indexing rule enhance the credibility of the monetary/fiscal regime change aimed at lowering inflation? Might an integrated indexing /monetary/fiscal regime change even approximate a regime change in Sargent's sense, which could eliminate inflation "very rapidly and with virtually no Phillips-curve costs in terms of foregone real output"[Sargent (1983): p. 57]?

Interaction of Wage Indexing with Asset/Tax Indexing

Blinder (1977) and Liviatan (1983) have pointed out that wage indexing is a substitute for asset market indexation. According to Blinder, with wage indexing "workers have less to gain from indexing wages and firms have more to lose" when indexed bonds are prevalent [Blinder (1977): p. 69]. Liviatan points out that in an economy with indexed bonds, the optimal degree of wage

indexation may be indetermiate [Liviatan (1983): p. 271].

The problem with the Blinder/Liviatan approach is that it neglects the usual ordering of the implementation of indexing policy (usually wages first, then bonds). When inflation sets in, equity considerations put enormous pressure for quick indexing of wages. Only later does indexing spread to the asset market. Blinder and Liviatan seem to argue that wage indexation may not be necessary if an indexed bond market exists. Perhaps the reverse is true: bond indexation may not be necessary if wages are already indexed. In any case, the Blinder/Liviatan approach suggests the possibility of too much indexing in an economy with indexed wages and assets. A case can thus be make for disindexation of wages in an economy with indexed assets.

Fischer (1983a) explicitly analyzed the efects of indexed bonds on output stability. He found that bond indexing destabilized an otherwise stable model if the budget deficits were financed by money creation. Fischer emphasized, however, that this link between bond indexing and instability is "not inevitable but a matter of choice" [Fischer (1983a): p. 541].

Fischer´s result, in combination with Blinder/Liviatan, makes bond indexing an attractive alternative to wage indexing, since bond indexing serves the same economic function as wage indexing and does not necessarily have the same destabilizing effects. However, the attractiveness of such a substitution depends on the credibility of the government not to finance deficits in succeeding periods with money creation. Time inconsistency of government policy may make this substitution a destabilizing alternative.

As for tax indexing, Bruce (1981) found that combined wage and tax indexing may have an ambiguous stabilizing effect on output resulting from demand and supply shocks. Wage indexing makes output less sensitive to demand shocks and more sensitive to supply shocks, while tax indexation has the

reverse effects. The results of Bruce's model thus support the non-indexation of the tax system, if the aim of policy-makers is to reduce the ouput effects of monetary shocks. If the economy is subject to real shocks without monetary shocks, should wages be disindexed and the tax system indexed, in order to stabilize output? Bruce's paper implies that policy-makers must proceed with indexing in various sectors with caution, since indexing in one sector (the tax system) may thwart the goals of indexing in another sector (the labor market). It also tells us that it is perfectly consistent for policy-makers to index one sector while avoiding indexation in other sectors of the economy.

Of course, Bruce had to side-step many of the complications of implementing tax indexation for the sake of simplicity and tractability. Indexation of the tax system should overcome two types of distortions induced by inflation: distortion of the tax base and distortion of the rate structure. Inflation-sensitive elements of income which pose problems for indexing are capital gains and losses, interest payments, and business deductions for depreciation and the cost of materials used. Aaron (1976) identifies three issues in the tax treatment of depreciation and capital gains: (1) should historical costs be adjusted for changes in general price level; (2) should depreciation take account of changes in relative prices, and (3) shold accrued capital gains and losses from relative price changes be included in depreciation [Aaron (1976): p. 11]?

The problems of adjusting income, espeically business income, as the tax base when there are inflationary-induced distortions, may be avoided if an expenditure tax is implemented as an alternative to an income tax. Cited by Kaldor in Hobbes' Liviathan, Kaldor advocated this system for the United Kingdom as a member of the Royal Commission on the Taxation of Profits and Income in 1950 [Kaldor (1950)]. Seidman (1984) recently considered the

transition problems of conversion from an income tax to an expenditure tax. He pointed out that such a conversion "that raises the same total revenue from the whole population" will "usually significantly raise the tax burdens on older cohorts" [Seidman (1984): p. 248]. A policy of age-phasing would thus need to accompany the conversion to an expenditure tax.

The relative costs and benefits of income and expenditure taxes in an inflationary environment are long standing issues in public finance research. The integration of this literature with wage indexing, especially wage indexing in the open-economy, is an area for future development.

B. Open-Economy Models

Six issues appear in the literature on indexing in the open economy context: (1) How do exchange-rate indexing rules affect output stabilty? (2) How do wage indexing rules trade-off with policy reaction functions for promoting stability? (3) Should the choice of fixed and flexible exchange rate regimes affect the degree of wage indexing? (4) What price indicators should be used in indexing rules in the open economy? (5) How do the indexing rules affect contract length and output stability with "sticky" price setting behavior and flexible exchange rates and, (6) Are there any symmetric multivariate rules for wage/exchange rate indexing which outperform simple rules in terms of reducing instability? These interrelated, increasingly complicated and controversial issues are the subjects of this section.

It is apparent that rules for the exchange rate are economically quite different from the indexation of wages and taxes. In the latter case, indexing has to do with contracts or legal obligations, while exchange rate rules are guidelines for monetary policy. Such rules belong to the same

species of economic phenomena as the gold standard and other money supply rules. Thus, it may apear a bit artifical to discuss these two applications of indexing in the same context, in a symmetric framework. After all, the "adjustment costs" of changing a money supply rule for exchange rate indexing may be considerably lower than the costs of changing wage indexing rules. This symmetric treatment of wage/exchange rate indexing is a principal drawback of much of the discussion of wage indexing in the international context.

Exchange-Rate Indexing

In the open-economy context, it is natural for policy-makers to consider indexing the exchange rate. Dornbusch (1982) and Neihans (1980,1984) consider the effects of purchasing-power-parity rules for exchange rate indexation in models without wage indexing. If foreign inflation is constant and relativiely low compared to domestic inflation, this rule, of course, amounts to indexing the exchange rate to domestic inflation. Dornbusch found that this indexing leads to "increased instability of prices and potentially increased instability of output" [Dornbusch (1982): p. 165]. Niehans contends that the PPP rule requires "alternative expansions and contractions of the money supply" and thus "the efforts to insulate the domestic economy from disturbances produce economic fluctuations" [Niehans (1984): p. 280]. Dornbusch concluded that policy-makers should not simply focus on the target of a constant real exchange rate, but should "consider the problem in a broader context" which "evaluates the relative costs of real instability, and target instability" [Dornbusch (1982): p. 165]. Niehans believes that some "less automatic measures of limited duration" might accomplish the same

objectives of exchange rate indexing "without suffering its weaknesses" [Neihans (1984): p. 280].

Like the Bruce results for tax indexing, the Dornbush/Niehans results suggest that "selective indexing" is a viable option. While wage indexing may be stabilizing, these papers show that exchange rate indexing might not. Neither Dornbusch nor Niehans, however, considered the relationship and trade-offs between optimal wage indexing and exchange rate policy, however artificial this relationship may seem. That is the subject of the following sections.

Wage Indexing and Policy Responsiveness

Cardoso (1981), Leiderman (1982), and Turnovsky (1983) considered the relationship between wage indexing and the responsiveness of monetary policy to various shocks in the open economy context.

Cardoso found that passive or accomodating monetary policy (to price changes) in a system of indexed wages and exchange rates will cause inflation to follow a "random walk" around a constant growth rate [Cardoso (1981): p.1]. Leiderman found that monetary accomodation to imported intermediate goods prices in a system of indexed wages and flexible exchange rates makes "vicious circles" in prices and exchange rates more likely [Leiderman (1982): p.71]. Both Cardoso and Leiderman thus draw attention to the inflation feedback process induced by wage indexing and passive monetary policy. Cardoso concentrates on the feedback effect of past inflation on current inflation while Leiderman deals with the feedback effects of passive monetary policy. Thus the advisability of indexing critically depends on the monetary regime being followed.

While Cardoso and Leiderman concentrated on the interaction of simple indexing rules with a simple passive monetary policy linked to prices, Turnovsky (1983) explored the relationship between optimal indexing and exchange market intervention rules for monetary policy. He found that if wages are fully indexed to the consumer price index (CPI), then exchange market intervention becomes "totally ineffective in shielding the real part of the economy from any stochastic disturbance" [Turnovsky (1983): p.23]. On the other hand, if monetary intervention policy in the exchange market "exactly accomodates for nominal movements in the demand for money", then any form of wage indexation is totally ineffective for the stabilization of the real part of the system" [Turnovsky (1983): p.23] Turnovsky also pointed out that it is not possible to "stabilize exactly for all stochastic disturbances simultaneously" through indexation and/or exchange market intervention [Turnovsky (1983): p.23].

Turnovsky considered the comparative advantages of wage indexing and exchange market intervetion for a variety of disturbances in his model. His results generalize the Gray/Fischer results. For a variety of disturbances, except supply disturbances, output can be stabilized by fully indexing wages to the price of domestic output. However, in the open-economy context, this means less-than-full indexation to the consumer price level. His results show that indexing can work, if wages are not fully indexed to the CPI, and monetary policy is guided by a consistent exchange-market intervention rule.

The analysis of Cardoso, Leiderman, and Turnovsky shows that the optimal use of wage indexing implies two types of restrictions: (1) restricting the choice of price indicators for the wage indexing rule, and (2) restricting monetary policy to a consistent intervention rule. These papers show that indiscriminate indexing policy, which ignores these retrictions, may make

matters worse, much worse, for output and price stability. Indexing can no longer be seen as a simple ad-hoc response to inflation in the labor market.

Indexing and the Choice of Exhange Rate Regime

Flood and Marion (1982) and Marston (1982) examined the relationship between wage indexing and the choice of exchange rate regime. These authors presuppose that a country actually has such a choice. They also leave out the likelihood of exchange rate "overshooting" in a flexible exchange rate system, which can only increase output instability, through large swings in the exchange rate and its effects on output in the traded-goods sector.

Flood and Marion found full indexation to the CPI optimal for a fixed rate system but partial indexation optimal for a flexible rate system [Flood and Marion (1982): p.54]. Overall, Flood and Marion find flexible rates with partial indexing to be superior to fixed rates with full indexing in terms of minimizing output variability [Flood and Marion (1982): p.54].

Of course, the results of Flood and Marion represent two polar cases in Turnovsky's framework for indexing and exchange-market intervention. Full indexation may be allowed, but only if monetary policy is at the service of a fixed exchange rate system. When monetary policy is free of exchange rate considerations, in a purely floating system, then partial indexing is necessary. However, Flood and Marion make one further point: full indexing may not be optimal even in a fixed exchange rate system, if the country is large in one market, since " domestic supply disturbances can alter the price of domestic output" in this circumstance [Flood and Marion (1982); p.60]. Then, indexing should be less than one, "in order to exploit the correlation between domestic supply shocks and price prediction errors" [Flood and Marion

(1982): p.60].

In the absence of indexation, Marston sees flexible rates as superior to fixed rates in the case of aggregate demand disturbances, but fixed rates preferable in the case of monetary disturbances [Marston (1982): p.95]. The effect of indexing is to "blur the differences", since full indexation will eliminate the "advantages or disadvantages of flexibility in modifying output changes" [Marston (1982): p.95]. So far, Marston´s results are consistent with those of Flood and Marion. Switching from a fixed to a floating system calls for a reduction in the degree of wage indexation. Otherwise, the advantages of this switch will be blurred.

Marston adds one further generalization. What matters is not only the degree of indexation at home, but also the degree of indexation abroad. If the degree of indexing is lower at home than abroad, then the home country should prefer a flexible system. On the other hand, if the degree at home is higher than abroad, then the home country should prefer fixed rates. Finally, if the degree of indexing is identical in the two countries, then the "output variation is identical in the two regimes" following foreign disturbances [Marston (1982): p.102].

The results of this section are consistent with disindexation policies aimed at reducing th degree of linkage of wages to inflation. If a country has shifted to flexible rates to free monetary policy for purposes of internal stabilization goals, then a reduction in the degree of wage indexing is also called for, to a level of indexing at least equal to that of major trading partners. Without this adjustment, there may be no gains from switching to floating rates. In the event of overshooting exchange rates, of course, an adjustment of indexing is even more important, in order to reduce some of the output instability induced by higher exchange rate volatility and shifts in

activity in the traded-goods sector. However, the determination of an optimal indexing rule under overshooting exchange rates is far from the scope of much of this literature.

Selecting Price Indicatiors in Open-Econmy Indexing

Marston and Turnovsky (1982), Aizenman (1983a) and Marston (1983) have examined in greater detail the issue of specifying the proper price indicator for indexing wages in the open economy. As stated above, Turnovsky (1983) called for indexing wages to the price of domestic output--thus restricting the indexing rule to one component of the general price index. This restriction is one form of disindexation, and it has the advantage of simplicity. Are there alternatives?

Marston and Turnovsky (1982) propose a "value-added deflator" designed to stabilize employment following changes in the price of imported materials. This deflator is a "weighted average of the price of final goods and imported inputs" with "the weights on the former being greater than unity and the weight on the latter being negative" [Marston and Turnovsky (1982): p.6]. For a given percentage rise in the price of imported materials, with this rule the "required downward adjustment" in the real wage "almost certainly will be less than proportional" [Marston and Turnovsky (1982): p.9].

Aizenman (1983a) calls for "basket indexing" in the wage rule, which links wage adjustment to the general price level and the relative price of tradeable to non-tradeable goods. The benefits of using "basket indexation" increase "with the share of traded goods, substitutabilty in production and consumption between the traded and non-traded sectors, and with the volatility of foreign shocks" [Aizenman (1983a): p.12]. The net effect is to "shield the

labor market form foreign shocks" [Aizenman (1983a): p.12]. However, Aizenman points out that the same effect of basket indexation of wages could be obtained by the use of basket indexation in the money supply rule [Aizenman (1983a): p.12]. In the case of the wage rule or money supply reaction function, the relative weights for the general price level and the relative tradeable/non-tradeable price level come from the minimization of a loss function based on deviations of actual output in a frictionless economy.

Finally, Marston (1983) emphasizes that the polar cases, full indexation to the domestic output price (GNP deflator) or full indexation to the general price (CPI) do not give optimal results. Instead, a mixed form is optimal. However, no single weighting scheme will do for all cases. Marston points out that "changes in the terms of trade" ensure that a rule "which is ideal for some disturbances" will "exacerbate the effects of other disturbances" [Marston (1983): p.18].

These results tell us that the optimal weights for price indicators in a wage rule must change with varying conditions. Whether we call these indicators "value-added deflators" or basket indexing, the weighting scheme is likely to change with openness, production and consumption patterns, and the volitility of foreign shocks. A stable weighting scheme to well-known indicators no longer suffices. The adoption of wage indexing in the open economy involves the use of multivariate basket indicators with variable weights. Such a prospect cannot but make policy-makers less enthusiastic about indexing.

Indexing, Wage Re-Negotiation, and Price Flexibility

The above analysis points out the problem of finding an optimal indexing

scheme for the economy. Of course, indexing would not be needed if recontracting were costless. Gray (1978) and Aizenman (1984) consider the trade-offs between optimal indexing and recontracting. Aizenman's work is an extension of Gray's analysis to the open economy.

The relationship between indexing and the duration of contracts is of fundamental importance, and raises questions about the basic function of indexing. Is indexing an instrument for stabilizing the economy, or is it an arrangement which permits long-term contracts even with inflation rates? To investigate the consequences of indexing without considering the alternative of short-term contracts is akin to discussing demand without reference to price.

Gray showed that for any given degree of indexing, contract length will decrease with the level of uncertainty and increase wiht the cost of contracting [Gray (1978): p.1]. If indexing is costly, on the other hand, it will appear only in longer contracts [Gray (1978): p.1]. Gray argued against any government regulation of indexing arrangements, since that will "necessarily impose social costs" [Gray (1978): p.15]. The optimal level of indexing is jointly determined wiht contract length in Gray's framework, and will vary across industries "in response to variations in the size of industry specific shocks" [Gray (1978): p.15]. Government intervention thus cannot help but force the system "away from the optimal degree of indexing" and impose "real resource costs, part of which will be reflected in decreased contract length" [Gray (1978): p.15].

Aizenman (1984) posed the indexing/recontracting problem in the context of an open-economy. His work thus extends the results of Gray. The optimal frequency of recontracting depends on the "relative importance of real and monetary shocks" [Aizenman (1984): p.10]. With respect to aggregate

volatility, optimal indexation is homogenous of degree zero and optimal recontracting is homogenous of degree one [Aizenman (1984): p.10].

How does this analysis relate to the choice of exchange rate regime? Given the costs of recontracting and indexing, floating exchange rates become "more desirable" as the "volatility of foreign prices and real shocks increase", because the exchange rate adjustment "mitigates the effects of these shocks" [Aizenman (1984): p. 10]. On the other hand, the "relative desirability" of a fixed rate system increases "with the volatility of domestic money and foreign interest rates" because "fixed rates isolate domestic output from the volatility of foreign interest rates and domestic moeny supply" [Aizenman (1984): p.14].

Aizenman, of course, does not consider the overshooting issue, when exchange rate flexibility may magnify the effects of foreign shocks on output. Since both monetary and real shocks may cause large changes in the exchange rate, with overshooting, it may be hard to disentangle "aggregate volatility" from the "relative importance" of real and monetary shocks. In a flexible system with overshooting, the destabilizing effects of real and monetary shocks may be magnified in different ways, so that the "relative importance" criterion will have to change in the more volatile flexible rate system. In turn, this will necessitate changes in indexation of wages.

In the previous analysis, the benefits of indexing come from the short-term rigidity of wages due to contract length. In this literature, Aizenman sees a built-in "asymmetry" where "wages might be pre-set" but "goods prices are flexible" [Aizenman (1983b): p.10]. Aizenman thus sees the need to examine indexing in a "symmetric" framework, where "prices can exhibit short-run rigidity" [Aizenman (1983b): p.10]. This rigidity is endogenously determined by making price changes costly, and "is manifested in deviations

from ppp" [Aizenman (1983b): p.10]. Aizenman finds that the beneficial results of indexing depend on the internal flexibility of prices. Given an optimal level of indexing, a "more inflexible price structure" will lead to "higher output variability" and "larger deviations from ppp" [Aizenman (1983b): p. 10]

Aizenman's recognition that price changes are costly and that there may be "deviations from ppp", of course, is an acknowledgement of the overshooting issue. From one perspective, the problem may be seen as one of sluggish price adjustment. From another perspective, it may be seen as excessively volatile exchange rates. Nevertheless, Aizenman's realistic results thus puts one more burden on the use of indexing policy. Unless policy-makers are also willing to take steps to reduce the costs of changing prices, and make the price structure more flexible, or face a situation with insignificant deviations from ppp, the beneficial stabilizing effects of optimal indexing may be significantly reduced or may never appear. This paper is thus consistent with a very reserved and carefully considered attitude toward the use of indexing in the open economy context, especially in a system of flexible exchange rates.

Multivariate Rules for Indexing and Exchange Market Intervention

Aizenman and Frenkel (1984) generalize the work of Turnovsky (1983) by presenting a "joint optimizing framework" for the determination of an indexing rule and a monetary intervention function. Using a wage indexing rule based solely on the general price level and an exchange market intervention rule optimally geared to exchange rate deviations and foreign interest rates, they find that the resulting optimal wage indexing coefficient is "larger than the

corresponding closed-economy indexation coefficient" [Aizenman and Frenkel (1984): p.34]. However, they also point out that the use of only one variable, the general price level, in the wage rule does not permit "an efficient use of the more detailed information that is available in the open economy and that could be exploited in the adjustment of real wages" [Aizenman and Frenkel (1984): p.34]. They conclude that optimal policy will "succeed in attaining the targets" only if the "instruments are influenced by a sufficient number of independent indicators" [Aizenman and Frenkel (1984): p. 36]. This "sufficient number" is identical to the number of independent sources of information that "influence the determination of the undistorted level of the targets" [Aizenman and Frenkel (1984): p. 34].

The results of Aizenman and Frenkel, at first glance, suggest that a higher degree of indexing is not only possible but beneficial in an open economy, provided that the intervention rule is optimally determined. This optimal intervention rule must include not only exchange rate deviations, but also interest rates and purchasing-power parity deviations. Thus the cost of higher wage indexation is a highly determined monetary policy. They also argue for a multivariate feedback rule for wages, to exploit fully the information available to policy-makers and achieve further benefits. There is no discussion of the cost of including these further pieces of independent information in the feedback rule for wages.

Aizenman and Frenkel elegantly discuss the benefits of indexing in the context of open economy stabilization policy. Their results make it clear that indexing is a very complicated matter. If policy-makers wish to implement indexing and enjoy its benefits, they must accept these complications and restrictions in the conduct of monetary policy. As should be clear from previous results, failure to accept these complications may lead

to further instability.

III. Recent International Experience

This part will assess recent international experience with indexing in three sub-groups: (1) Brazil and Israel, countries with long experience with indexing, (2) Argentina, Chile, and Uruguay, where disindexing "experiments" were gradually implemented in the late 70's, as well as Finland and Iceland, which abruptly abolished indexing, and (3) Europe, Canada, and the United States, countries which practice indexing under conditions of moderate inflation. The final section will assess an international cross-section study of indexing.

A. Brazil and Israel: The Long-Term Indexers

Brazil and Israel are two countries with long experience with indexing - over three decades in Israel, over two in Brazil [see Fisher (1983b): p.3, Simonsen (1983): p. 119]. What can policy-makers learn from the experience of these two countries?

In Brazil there is controversy over the role of indexing in the "success story" of the late 60's and early 70's, when annual growth rates reached 10% and inflation was reduced from triple-digit levels to 30%. Fishlow (1974) and Kafka (1974) believe that exchange rate indexation was a critical element in this success story. However, Simonsen (1983) recently pointed out one aspect of the Brazilian success story with indexing, which Fishlow and Kafka neglected to mention: the wage indexing laws introduced in 1965 were "basically intended to act as incomes policy tools" [Simonsen (1983): p. 119].

There is also controversy about the role of indexing with the return of high inflation and output instability after the oil shocks of the late 70's. Simonsen sees wage indexing policy as a culprit. In 1979 the indexing law reduced the adjustment interval for wages from one year to six months, "with no downward revision of the real wage base" [Simonsen (1983): p. 122]. Thus, the government increased indexation at a time when real shocks were impinging on the economy. Simonsen predicted that the new system of indexation would lead either to "massive unemployment" or to a "sudden leap" in the rate of inflation. [Simonsen (1983): p. 122]. As it turned out, there was sudden leap: the previous annual inflation rate was quickly transformed into a six-month inflation rate [Simonsen (1983): p. 122]. Macedo (1983), on the other hand, takes issue with Simonsen's analysis. He believes that the 1979 wage law played the role of a "supporting actor" rather than being the "major star of the action" [Macedo (1983): p. 150]. Macedo blames the "ambiguity of government policies" which led to a "sanction of higher prices" for the accelerated inflation after 1979 [Macedo (1983): p. 150]. Whether the indexing law or the ambiguous government policy were the "major stars" or "supporting actors," one thing is certain: the combination of higher indexing and passive monetary policy led to increased instability, as predicted by theoretical work.

In a recent econometric study, Resende and Lopes (1981) found that indexing plays the dominant role in explaining the behavior of Brazilian inflation. When Resende and Lopes included changes in the monetary correction index for minimum wges in their inflation rate estimating equations, they found excess-demand terms to be insignificant. They concluded their study with a criticism of anti-inflation policies based on reducing excess demand, since monetary correction effectively caused this trade-off to dissappear in

Brazil [Resende and Lopes (1981): p. 615].

The resistence of inflation to reductions in excess demand is called inflationary inertia. For Brazil, Barbosa (1977) contends that much of the inertia can be explained by the "feedback effect" of past inflation on current inflation, passed on through the indexing system, which links current wages and exchange rates to past rates of inflation. These current wages and exchange rates, in turn, lead to higher inflation through "mark-up pricing" over wage/exchange rate cost variables. In this way, past inflation feeds back into current inflation. Contador (1977), on the other hand, has presented time series/spectral evidence which calls into question any relationship between the inflation feedback and the indexing system in Brazil. More recently, Arida and Lara-Resende (1984) argued for disindexation as a way to end the "inertial inflation." Citing the strong adjustment effort made through austerity measures in recent years, leading to a $125 billion surplus in the current account for 1984, Arida and Lara-Resende conclude that the reasons for the 1984 level of 230% inflation must be found "elsewhere" - in the Brazilian indexing system [Arida and Lara-Resende (1984): p. 6] However, the Arida/Lara-Resende disindexation proposal calls for a currency reform involving a new indexed money during a transition period. [Arida and Lara-Resende (1984): p. 28] [See Arida and Lara-Resende (1984): Appendix for a bibliography on inertial inflation in Brazilian literature.]

For Israel, both Karni (1979) and Fischer (1983b) blame the indexing system for significantly reducing the will to fight inflation [Karni (1979): p. 81, Fischer (1983b): p. 37] Since indexing has removed many of the inflation-induced distortions, policy-makers "frequently assert that the unemployment needed to disinflate successfully cannot be justified in Israel" [Fischer (1983b): p. 37]. According to Fischer, memories of the 1965-67

recession, with double-digit unemployment and net emigration, "has burned as deep a concern about unemployment in the memory" as the Great Depression did in the United States [Fischer (1983b): p. 37].

One of the major controversies in Israeli indexing experience arose over the linkage of government development bonds to the U.S. dollar exchange rate, after a 67% devaluation in 1962. Brenner and Patinkin (1977) state that the "public outcry was immediate" after debtors "had the traumatic experience of finding their nominal debt increased overnight by the same 67%" [Brenner and Patinkin (1977): p. 402; Fischer, (1984): p. 18]. Thereafter, the government did not index its loans until the 1970s. However during the past 10 years, the percentage of private debt indexed either to the exchange rate or the price level has steadily increased - more than 83% at the end of 1983 [Fischer (1984): p. 21].

Disindexation, or a reduction in the degree of wage indexing to the consumer price level, has also been an issue in Israeli anti-inflation policy. Brenner and Patinkin point out that as early as 1966, a "Committee of Experts" recommended the use of modified price indices for wages, which would exclude taxes and the prices of imported goods [Brenner and Patinkin (1977): p. 399]. These recomendations, unfortunately, were not carried out until the mid-seventies. Another committee in 1975 recommended the indexing of wages at a rate of 70% to the CPI. According to Fischer, this "70% rule" was presented as a "practical alternative" to indexing to the GDP deflator, but it is at best a "poor substitue for indexing to the appropriate deflator," since only "on average" it is right, and "in most periods wrong," sometimes "compensating too little for nominal shocks" and at other times "compensating too much for real shocks" [Fischer (1984): p. 16]. Fischer reports that the 70% adjustment was increased to 80% at the end of 1979, and "more recently contracts have

been reopened when real wage erosion exceeded prespecified thresholds" [Fischer (1984): p. 16].

The dynamics of inflation in recent Israeli experience show discrete step increases. According to Fischer (1984) the "radical change in the inflation process" can be "dated to 1977" rather than 1973, when Israel suffered the "double supply shocks" from oil and the "increased defence burden in the Yom Kippur War" [Fischer (1984): p. 3] Since 1977, inflation has risen from the "130% range to the 400% range at the end of 1983, and in the last two months of 1984 to the 1000% range" [Fischer (1984): p. 7].

Given the widespread asset indexation and reduced degree of wage indexing, it is not surprising that Fischer (1984) believes that the "wage indexation has virtually nothing to do with the important dynamics of inflation" while "asset market indexation has been more important" [Fischer (1984): p. 2]. Fischer cites evidence that the Israeli wage indexing system has permitted substantial real wage flexibility [Fischer (1984): p. 34]. Asset market indexation, however, has had more serious consequences by "reducing the real wealth effects of devaluations or adverse supply shocks" [Fischer (1984): p. 34]. After a devaluation, the jump in prices and the inflation rate has "no significant effect on aggregate demand," and "because the government is unwilling to risk unemployment," there is "nothing else to bring the inflation rate down" [Fischer (1984): p,. 35].

Brazil and Israel represent two highly indexed economies experiencing high inflation instability and low growth. Is there anything one can learn from comparing the experiences of these countries, besides the correlation of high indexing with high inflation? Kleiman (1977) points out that indexing spread in different directions in each country; in Brazil, bonds first, then wages, while in Israel, wages first, then bonds [Kleiman (1977): p. 170].

Kleiman cites "political attitudes" in both countries for this different historical ordering; under "pressure of economic and social forces" both countries "had to move away from their original positions" [Kleiman (1977): p. 170]. Kleiman sees one clear message: while selective indexing may be tempting to policy-makers, "the Brazilian and Israeli experiences indicate that such selective indexation may be impossible in practice" [Kleiman (1977): p. 170].

Another important difference in the Brazilian and Israeli indexing arrangements lies in the frequency of wage adjustment as the inflation rates have accelerated since the late 70's, in each country. Brazil has not changed the adjustment interval for wages since the 1979 law, even with 200% plus inflation. Israel, on the other hand, has experienced a progressive shortening of the wage adjustment interval, from a semi- or annual basis in the mid-sixties, to quarterly from 1980 to 1983, to monthly at the end of 1983 [see Fischer (1984): p. 15]. Dornbusch (1984) believes that Brazil's maintenance of the six month interval, "implying a drastic reduction of the purchasing power of wages between readjustments," is responsible for Brazil's inflation "not having accelerated toward 1000 percent as in Argentina, Bolivia, or Israel." [Dornbusch (1984): p. 3].

B. Argentina, Chile, Uruguay, Finland and Iceland: Disindexation Experience

In the past decade Argentina, Chile, and Uruguay have implemented policies aimed at gradual disindexation of the exchange rate and/or wages. These policies formed part of an oveall stabilization/liberalization plan, which involved decontrol of interest rates, tariff reductions, and removal of capital controls. Finland and Iceland, on the other hand, abruptly terminated

indexing after long periods in each country. Finland ended its indexing at the time of a devaluation in 1967, while Iceland followed suit in May 1983. Does "abrupt disindexation" do better than gradual disindexation? What lessons can policy-makers learn from these attempts at disindexation?

Argentina

Although wage indexation in the private sector is not covered by government policy in Argentina, wage disindexation still had a place in recent stabilization policy. A partial indexing of government workers' salaries, for example, was a principle means of cutting public-sector deficits in the mid-70s [see Frenkel (1980)]. However, exchange rate disindexation through the tablita or preannouncement of future exchange rates at rates of change lower than current inflation rates was the principle "disindexation policy" in Argentine stabilization policy. Roberto Frenkel sees this disindexation policy as one phase in the transition from the old orthodoxy to the new orthodoxy in Argentine stabilization policy [Frenkel (1980): p. 4].

One of the most confusing features of Argentine indexing and disindexation policy is that such policies were introduced in different sectors in different ways, showing the lack of any "organic policy" and consistency with the monetary/fiscal regime [see Gaba (1975)]. Hence it should not be surprising that most of the discussion of Argentine policy deals with financial sector reaction to the decontrol of interest rates, continuing budget deficits, and exchange rate policies aimed at gradual disindexation, through the tablita, towards a fixed nominal rate. Fernandez (1982), Frenkel (1981), and Rodriquez (1983) have emphasized the credibility problems, increased speculation, and ensuing crises in the banking system resulting from

these policy combinations. The end result was "disintermediation" and an increase in indebtedness [Rodriguez (1983): p. 42]. Thus, in 1981 Argentina had to abandon the tablita disindexing policy with a series of massive devaluations aimed at ending speculation and restoring stbility in the financial sector.

Chile

In contrast to Argentina, Chile has been subjected to explicit wage indexing rules during the past ten years. Saez (1981), Corbo (1982a), and Cortazar (1983) recently studied the evolution of these indexing policies. After 1973, wages were only partially indexed to past inflation rates. When collective bargaining was allowed in 1979 for a small percentage (10%) of the labor force, full compensation was allowed for this group. Finally, official government indexing rules were suspended in June 1982. Cortazar noted the real wage effects of Chilean partial indexing: between 1973-75, real wages fell 37% below their 1970 levels. Cortazar emphasized three aspects of the Chilean system: (1) nominal wages must be seen as an instrument of policy, like the exchange rate, (2) the official inflation rates often understated the true inflation rate, and (3) the labor market did not function as a market [Cortazar (1983): p. 1].

Corbo (1982b) and Cortazar (1983) recently presented econometric studies of Chilean inflation and wge adjustment. Corbo developed and estimated a neo-scandinavian model for Chile. Like Resende and Lopes for Brazil, Corbo found excess demand variables to be insignificant during the period of wage indexation. Cortazar found that wages were exogenously and exclusively determined by indexing policy until 1979. After 1979, he found some evidence

for a structural shift, but even with this shift, indexing policy continued to be the major determinant of wage adjustment.

What about exchange rate disindexation in Chile? As in Argentina, exchange rate disindexation, through the tablita, was coupled with decontrol of domestic interest rates. Arellano (1983) points out that the consequences of these policies were similar to those of Argentina: the growth of a highly speculative paper economy, a shortening of deposit and credit length, and a build-up of foreign indebtedness. Like Argentina, Chile had to abandon the tablita exchange rate disindexing system through devaluations in the early 1980s.

Uruguay

Like Argentina, wage indexing policy was not a central part of the Uruguayan stabilization program during the past ten years. In 1974, the government suspended wage controls and gradually lifted price controls. In 1979, exchange rate disindexation through the tablita became a central instrument for stabilization policy. As in Argentina and Chile, interest rates were decontrolled by the time the tablita was implemented. How successful was this policy? Hanson and de Melo (1984) point out that in the first twelve months of this policy, inflation actually rose. Thus, the policy "did not fulfill its intended objective of rapidly bringing down the rate of inflation" [Hanson and de Melo (1984): p. 45]. Convergence of domestic inflation to the exchange rate preannouncing occurred 24 months after the start of the program [Hanson and de Melo (1984): p. 45]. During this period the economy underwent a severe recession and Uruguay had to abandon the tablita in 1982.

The difficulties of the Uruguayan disindexation policy may be traced to a lack of coordination and consistency with Argentine policy. Hanson and de Melo point out that "as long as Argentina was pursuing a policy of overvaluation," the Uruguayan policy "dampened inflationary pressures" [Hanson and de Melo (1984): p. 51]. However, when Argentina abandoned its tablita and "embarked on a series of massive devaluations", Uruguay "continued its slow rate of crawl" thereby "aggravating the recession" [Hanson and de Melo (1984): p. 51].

The unsuccessful experiences of Argentina, Chile, and Uruguay with exchange rate disindexation through the tablita point out the need for consistency in the implementation and sequencing of stabilization programs, indexing rules, and liberalization, both within a particular country, and among close major trading partners. As Hanson and de Melo point out, stabilization policies in countries with a long history of high inflation is a "difficult and slow process" [Hanson and de Melo (1984): p. 52]. The experience of these three countries suggest that uncoordinated disindexation of wages and/or exchange rates may make that process even more difficult.

Finland and Iceland: Abrupt Disindexation

Indexing was introduced in Finland in 1944, as a result of the Moscow armistice in which Finland ceded about 10% of its territory to the USSR. Indexed indemnity bonds were given to the displaced families. After this, indexing spread to other sectors of the economy. By 1968, 75% of the total bonds outstanding were indexed.

The Finnish experience of indexation was ended after a 1967 devaluation, when it was feared that the indexed system of wages and assets would "undo the

benefits of the devaluation" and lead to a severe inflation [Braun (1976): p. 226]. At the time of the devaluation, the government pressed only for the removal of wage indexing, some wage linkage was considered the main factor for the "propagation of the inflationary impulses from abroad" [Linnano (1974): p. 23]. But as Linnamo reports, "in an effort to protect their share of national income," the "unions demanded the removal of other types of linkages as well." [Linnamo (1976): p. 23].

What happened after Finland abolished indexing? Unemployment decreased from over 4% to less than 2% between 1968-70, while the rate of change of wages continued to fluctuate between 6 and 12%. Only after the oil shock of 1973 did the rate of change of wages rise to levels above 18%. In an econometric study of wage inflation in Finland, Paunio and Suvanto (1981) report one result which seems to recur in most empirical studies of indexed systems. They found that during the period of indexing, "unemployment was not a significant determinant of wage change" [Paunio and Suvanto (1981): p. 179]. After the abolishment of indexing, however, the rate of unemployment became "significant in all the regressions" [Paunio and Suvanto (1981): p. 179.]. They conclude that a regime of indexing based on ex post compensation "may greatly weaken the influence of excess demand" on money wages [Paunio and Suvanto (1981): p. 180].

What about Iceland? Since 1939, indexation of all wages and salaries had been the general rule, whereas index bonds were fully permitted since 1979. Since the early 1980s, inflation accelerated to rates in excess of 100%, while GNP dropped by 2% in 1982 and 5.5% in 1983. Sigurosson (1984) reports that the increase in the Cost of Living Index between February and May 1983 was equivalent to 132 per cent at an annualized rate [Sigurosson (1984): p. 6].

After general elections in May, 1983, indexing was suspended the same day

that a devaluation was announced. The new program prohibited wage indexing until May 1985. However, Sigurosson (1984) reports that the government maintained indexation in the financial system in order to "stimulate financial savings in the face of a serious external deficit" [Sigurosson (1984): p. 8] The government also gave commerical banks a "freer hand" to set interest rates in the summer of 1984 [Sigurosson (1984): p. 9]

What, so far, are the results of the Icelandic experience of abrupt disindexation? Sigurosson (1984) reports a "significant accomplishment." Inflation fell from 130% in early 1982 to 10-15% in the autumn of 1984, while unemployment has remained satisfactory ("slightly above 1% of the labor force") and the external balance of payments improved [Sigurosson (1984): p. 9]. Sigurosson (1984) concludes his analysis of the Icelandic experience by stating that disindexation is probably necessary for a "rapid suppression of internal inflation" [Sigurosson (1984): p. 14]. While indexation may stabilize success, "it also aggravates failure", and since "failure is more common than success," he recommends that Iceland continue without indexation [Sigurosson (1984): p. 15].

C. Europe, Canada, and the United States

Europe, Canada and the United States practice indexing under conditions of moderate inflation. What information can one obtain from the recent experiences of these countries?

Europe

In a recent survey of European indexing, Emerson (1983) reports that there is some movement in Europe in favor of "less complete" wage indexation and "more extensive" financial asset indexation [Emerson (1983): p. 162]. The "extreme indexers" (Belgium and Italy) have moved to more qualified indexing, while the "intermediate indexers" (France, the Netherlands, Denmark, Ireland and Greece) have reduced the degree of indexing in wage adjustments. Emerson offers one specific motive for this movement toward disindexation in Europe: if these countries hope to create a regional monetary "block", then they must adjust and adapt "before a lethal mix of highly diverse indexing practices, international shocks, and integrationist monetary ambitions explodes" [Emerson (1983): p. 163].

Canada and the United States

Canada and the United States have a similar aproach to indexing. There are no official indexing rules, but neither are there prohibitions against indexing in private contracts. In contrast to indexing policy changes in Europe, how has indexing evolved in these two countries?

In an empirical study of private sector indexing in Canada, Card (1983) found evidence of time-varying elasticities of indexation of wages to the general price level. He reported that there was a "tendency towards higher marginal elasticities over the 1968-75 period" but that this trend has been irregular [Card (1983): p. 35]. One explanation he offered for this trend was the "increased volatility" in the aggregate price level over this period [Card (1983): p. 35].

For the United States, Ehrenberg, Danziger, and San (1983) report that

most of the changes in the proportion of indexed contracts seems to be correlated with aggregate price uncertainty. In 1958, the proportion of workers in major union contracts with indexing was 50%, in 1966, 20%, and in 1978, 60%, with little fall since then. All of these clauses link wages to the consumer price level; 95% of them are expressed in absolute (rather than percentage change) relationships between wages and prices [see Card (1983): p. 30, footnote 32].

The inflationary experience of Europe, Canada, and the United States is, of course, different from that of countries with long and high inflation, so indexing policies have not been as controversial. What lessons emerge from the experience of these countries? First, the movement in Europe towards coordinated disindexation policy is consistent with monetary policy necessary for the "integrationist monetary ambitions" and gives hope to these ambitions. Secondly, the correlation of the level of indexation (measured either by a time-varying elasticity or the percentage of workers with indexed contracts) with price level uncertainty in Canada and the United States suggests that the level of indexation could become a problem - and thus a destabilizer - if monetary authorities let price variability significantly increase. Given the problems of finding the optimal level of indexation and reducing the level of indexing to this value, Canada and the United States should avoid letting higher price variability trigger higher indexing, not by restricting indexing, but by maintaining stable prices.

D. International Cross Section Evidence

Recently, Fisher (1983a) presented a simple cross section study of 40 countries designed to determine the effects of various forms of indexation on

inflationary adjustment. Fischer used as the dependent variable for each country a ratio of post-OPEC inflation to pre-OPEC inflation. The independent variables were a series of dummy variables for various forms of indexing, in wages, taxes, government bonds, social security, and capital markets. He found that none of the indexing variables were significant factors in determining the ratio of post-OPEC to pre-OPEC inflation. Some of the "indexing dummies" turned out to have negative effects (but insignificant) on this inflation ratio.

Of course, Fischer's definition of the independent indexing variables was quite simple. Brazil and the United States, for example, had wage indexing dummies set at one, even though the United States simply permits indexing in private contracts, while Brazil has an extensive system of official rules for wage adjustments. There was also no dummy variable for exchange rate indexing in Fischer's study. Still, the results of Fischer's study illustrated one basic point: indexing is ambiguous. There is little one can say about the effects of indexing on stability, except in the context of an economy's monetary policy, exchange rate regime, openness, and the indexing policies of major trading partners. The cross-section evidence is thus consistent with recent theoretical work. Indexing is a macroeconomic policy, and its effectiveness and advisability depends on an integrated view of a country's stabilization goals and international position. Unless indexing is assessed from this framework - complicated as it is - implementation of indexing rules may turn out to be impediments rather than aids to stabilization policy.

IV. Conclusions

This paper has reviewed recent theoretical developments and international experience with indexing. Is there any evidence of convergence between these theoretical and historical developments towards fruitful policy formulation? Have theoretical insights been reflected in institutional adjustments or historical studies of indexing? In turn, have specific difficulties in recent international experiences been reflected in new theoretical developments? What further theoretical and/or empirical work needs to be done? Finally, is there an emerging concensus view of indexing in the literature of the past decade?

The movement towards disindexation in Europe and Israel reflects theoretical developments which call for a degree of indexing below unity, in order to mitigate the destabilizing effects of real shocks on output. So does the attempt to coordinate indexing rules among members of the European Monetary System. What about the reverse - how well do the models reflect problems in recent international experience? Here, too, there is evidence of convergence. The destabilizing effects of the OPEC shocks in the highly-indexed economy of Brazil and the failures of the uncoordinated and inconsistent disindexation policies in the Southern Cone are outcomes easily predicted and accounted for in recent theoretical developments.

What further work needs to be done, in order to enhance this convergence towards better policy formulation? First, it is clear that many countries are not optimally indexed. How does a country move from a sub-optimal over-indexed situation to a lower-indexed (and thus more stable) situation? What adjustment costs are involved? Is there an optimal process for the timing and sequencing of disindexation, equating the marginal costs of changing rules

with the marginal gains of increased stability? Certain countries (such as Israel and Brazil) appear not to have disindexed sufficiently, while in others (Argentina, Chile, and Uruguay) the disindexation has been gradual but uncoordinated, with disasterous results. In Israel, furthermore, the pressure is for asset market disindexation but not wage disindexation, while Iceland experienced a successful stabilization with wage disindexation but not asset disindexation. Finland, in contrast to both Israel and Iceland, disindexed both in its stabilization program. Alternatively, should disindexation be accompanied by a currency reform, as has recently been proposed in Brazil? Thus, a theoretical study of "adjustment costs" of indexing rules for wages, assets, and/or the exchange rate may make disindexation a more feasible policy for countries with sub-optimal over-indexed systems. So far, the models of indexation in closed or open economies have not been much help to policy-making in this crucial area of stabilization policy. The data and information from recent disindexation experiences may also reveal a great deal about the effects of each type of disindexation "news" on price setting behavior and the effects of thes policies on inflationary inertia in various institutional frameworks. More econometric information about these experiences is needed to enhance the prospects of finding a successful approach to disindexation policy.

Despite the controversies and various approaches to indexing during the past decade, can one say there is an emerging concensus view? Yes. Indexing may bring more difficulties than benefits, if the rule is not optimal. Finding the parameters for this optimal rule and specifying the consistent monetary policy turns out to be a very complex problem. Consequently, the need for indexing rules should be avoided through the maintenance of price stability. Indeed, to lower transactions costs and thus to increase the

efficiency of the economy by obviating the need for indexing rules (or shorter contracts) may be one of the basic functions of the central bank. For countries with high inflation and sub-optimal over-indexed systems, disindexation is now at the center of the debate and research agenda. Thus, in ten years, the call of Friedman and Giersch for full indexation has been reversed. The call is now for disindexation, both in policy-making and in macroeconomic research.

SELECTED BIBLIOGRAPHY

Aaron, H. (1976), Inflation and the Income Tax, Washington: The Brookings Institution.

Aizenman, (1983b), "Openness, Relative Prices, and Macro Policies," NBER Working Paper No. 1233.

_____, (1983b), "Modelling Deviations from Purchasing Power Parity." NBER Working Paper No. 1066, International Economic Review, forthcoming.

_____, (1984), "Optimal Wage Re-Negotiation," NBER Working Paper 1279, Journal of Monetary Economics, forthcoming.

Aizenman, J. and J. Frenkel (1984), "Optimal Wage Indexation, Foreign Exchange Intervention, Monetary Policy," NBER Working Paper.

Arellano, J.P. (1983), "De la Liberalización a la Intervención: El Mercado de Capitales de Chile, 1974-83." Unpublished.

Arida, P. and A. Lara-Resendes (1984), "Inertial Inflation and Monetary Reform." Unpublished.

Barbosa, F.H. (1977), "Correção Monetaria e Realimentação Inflacionaria," Pesquisa e Planejamento Economico, 8, 757-79.

Barro, R. (1976), "Indexation in a Rational Expectations Model," Journal of Economic Theory, 13, 229-44.

Blanchard, O. (1979), "Wage Indexing Rules and the Behavior of the Economy," Journal of Political Economy, 87, 798-815.

Blinder, A. (1977), "Indexing the Economy through Financial Intermediation," Carnegie-Rochester Conference Series on Public Policy, 5, 69-108.

Braun, Anne Romanis (1976), "Indexation of Wages and Salaries in Developed Economics," IMF Staff Papers, 226-271.

Brenner, R. and D. Patinkin (1977), "Indexation in Israel," in E. Lunberg, ed., Inflation Theory and Anti-Inflation Policy. London: Macmillan, 387-416.

Bruce, N. (1981), "Some Macroeconomic Effects of Income Tax Indexation," Journal of Monetary Economics, 8, 271-75.

Card, D. (1983), "An Empirical Model of Wage Indexation in Union Contracts." Unpublished.

Cardoso, E. (1981), "Indexation, Monetary Accomodation, and Inflation in Brazil." Unpublished.

Contador, C. (1978), "O Efeito Realimentador da Correção Monetaria," Pesquisa e Planejamiento Econômico, 7, 663-690.

Corbo, V. (1982a), "Recent Developments of the Chilean Economy." Unpublished.

_____, (1982b), "Inflación en Una Economia Abierta: El Caso de Chile," Cuadernos de Economia, 56, 5-15.

Cortazar, R. (1983), "Politicas de Reajustes y Salarios en Chile: 1974-1982." Unpublished.

Cukierman, A. (1980), "The Effects of Wage Indexation on Macroeconomic Fluctuations: A Generalization," Journal of Monetary Economics, 6, 147-171.

Dornbusch, R. (1982), "PPP Exchange Rate Rules and Macroeconomic Stability," Journal of Political Economy, 90, 166-175.

_____, (1984), "The LARIDA Proposal Comments." Unpublished.

Ehrenberg, R., L. Danziger, and G. San (1983), "Cost of Living Adjustment Clauses in Union Contracts: A Summary of Results," Journal of Labor Economics, 1, 215-45.

Emerson, M. (1983), "A View of Current European Indexation Experiences," in R. Dornbusch and M. Simonsen, ed., Inflation, Debt and Indexation, Cambridge: MIT Press, 1960-82.

Fernandez, R. (1982), "La Crisis Financiera Argentina 1980-82." Unpublished.

Fischer, S. (1977), "Wage Indexing and Macroeconomic Stability," Carnegie-Rochester Conference Series on Public Policyl, 5, 107-48.

_____, (1983a), "Indexation and Inflation," Journal of Monetary Economics, 12, 519-42.

_____, (1983b), "The Economy of Israel," NBER Working Paper No. 1190.

_____, (1984), "Israeli Inflation and Indexation." Unpublished.

Fisher, I. (1922), The Purchasing Power of Money. New York: Augustus Kelly.

Fishlow, A. (1974), "Indexing Brazilian Style: Inflation Without Tears," Brookings Papers on Economic Activity, 2, 261-82.

Flood, R. and N. Marion (1982), "The Transmission of Disturbances Under Alternative Exchange Rate Regimes with Optimal Indexing," Quarterly Journal of Economics, 97, 43-66.

Frenkel, R. (1980), "Las Recientes Politicas de Estabilización en Argentina: de la Vieja a la Nueva Ortodoxia." Unpublished.

_____, (1981), "A Abertura Financiera: O Caso Argentina," Pesquisa e Planejamento Econômico, 11, 323-82.

Freidman, M. (1974), "Monetary Correction," in Essays on Inflation and Indexation. Washington: American Enterprise Institution, 25-62.

Gaba, E. (1975), "Indexación y SIstema Financiero," Unpublished.

Giersch, H. (1974), "Index Clauses and the Fight Against Inflation," in Essays on Inflation and Indexation. Washington: American Enterprise Institute.

Gray, J.A. (1978), "Wage Indexation: A Macroeconomic Approach," Journal of Monetary Economics, 2, 225-35.

_____, (1978), "On Indexation and Contract Length," Journal of Political Economy, 86, 1-18.

_____, (1982), "Wage Indexation, Incomplete Information, and the Aggregate Supply Curve," in R. Dornbusch and M. Simonsen, eds., Inflation, Debt and Indexation, Cambridge, MIT Press, 25-45.

Hanson, J. and J. de Melo (1984), "An Assessment of Reforms and Macroeconomic Developments in Uruguay." Unpublished.

Jevons, W.S. (1875), Money and the Mechanism of Exchange, London.

Kafka, A. (1974), "Indexing for Inflation in Brazil," in Essays on Inflation and Indexation. Washington: American Enterprise Institute.

Kaldor, N. (1955), An Expenditure Tax. London: Allen and Unwin, Ltd.

Karni, E. (1979), "The Israeli Economy, 1972-76: A Survey of Recent Developments and the Return of an Old Problem," Economic Development and Cultural Change, 28, 63-76.

_____, (1983), "On Optimal Wage Indexation," Journal of Political Economy, 91, 282-92.

Kleiman, E. (1977), "Monetary Correction and Indexation: The Brazilian and Israeli Experience," Explorations in Economic Research, 4, 141-76.

Linnamo, J. (1974), "The Role of Indexation," Proceedings of the Saltsjobaden Conference. Geneva: International Center for Monetary and Banking Studies.

Leiderman, L. (1982), "Monetary Accomodation and the Variability of Output, Prices and Exchange Rates," Carnegie-Rochester Conference Series on Public Policy, 16, 47-85.

Liviatan, N. (1983), "On the Interaction between Wage and Asset Indexation," in R. Dornbusch and M. Simonsen, eds. Inflation, Debt, and Indexation. Cambridge: MIT Press, 267-80.

Lowe, Joseph, (1822), The Present State of England in Regard to Agriculture and Finance. London.

Macedo, R. (1983), "Wage Indexation and Inflation: The Recent Brazilian Experience," in R. Dornbusch and M. Simonsen, eds. Inflation, Debt, and Indexation. Cambridge: MIT Press, 133-59.

Marston, R. (1982), "Wages, Relative Prices, and the Choice between Fixed and Flexible Exchange Rates," Canadian Journal of Economics, 15, 87-103.

_____, (1983), "Real Wages and the Terms of Trade: Alternative Indexing Rules for an Open Economy." NBER Working Paper No. 1254.

Marston, R. and S. Turnovsky, (1982), "Imported Materials Prices, Wage Policy, and Macroeconomic Stabilization." NBER Working Paper No. 1254.

Niehans, J. (1980), "Dynamic Purchasing Power as a Monetary Rule," in J.S. Chipman and C. Kindleberger, eds. Flexible Exchange Rates and the Balance of Payments: Essays in Honor of E. Sohmen. Amsterdam: North Holland, 213-30.

_____, (1984), International Monetary Economics. Baltimore: Johns Hopkins.

Paunio, J. and A. Suvanto, (1981), "Wage Inflation, Expectations and Indexation," Journal of Monetary Economics, 8, 165-182.

Pazner, E. (1981), "On Indexation and Macroeconomic Stability," in M.J. Flanders and A. Ravin, eds. Development in an Inflationary World. New York: Academic Press.

Resende, A.L. and F. Lopes (1981), "Sobre as Causas de Recente Aceleração Inflationaria," Pesquisa e Planajamento Econômico, 11, 599-616.

Rodriguez, C.A. (1983), "Politicas de Estabilización en la Economia Argentina," Cuadernos de Economia, 59, 21-42.

Saéz, R.E. (1981), "Evolución de la Indexación en Chile." Unpublished.

Sargent, T. (1983), "Stopping Moderate Inflations: The Methods of Poincare and Mrs. Thatcher," in R. Dornbusch and M. Simonsen, eds. Inflation, Debt, and Indexation. Cambridge: MIT Press, 99-132.

Scrope, G.P. (1833), An Examination of the Bark Charter Question with an Inquiry into the Nature of a Just Standard of Value. London.

Seidman, L. (1984), "Conversion to a Consumption Tax: The Transition in a Life-Cycle Growth Model," Journal of Political Economy, 92, 247-67.

Sigurosson, J. (1984), "Recent Experience with Deindexation in Iceland," Unpublished.

Simonsen, M.H. (1983), Indexation: Current Theory and the Brazilian Experience," in R. Dornbusch and M. Simonsen, eds. Inflation, Debt, and Indexation. Cambridge: MIT Press,

Taylor, J. (1975), "Monetary Policy during a Transition to Rational Expectations," Journal of Political Economy, 83, 1005-1021.

Turnovsky, S. (1983), "Wage Indexation and Exchange Market Intervention in a Small Open Economy," Canadian Journal of Economics, 16, 574-92.

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