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**INDEXING AS AN INSTRUMENT FOR STABILIZATION  
POLICY: A SURVEY OF THEORETICAL  
DEVELOPMENTS AND INTERNATIONAL  
EXPERIENCE DURING THE PAST DECADE**

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## **ABSTRACT**

This paper surveys the literature on indexing as an instrument for stabilization policy during the past decade. The first part of the paper concentrates on the effects of wage indexing on macroeconomic stability and the comparative advantages of indexing and exchange rate policy. The second part presents a survey of recent international experience with indexing. The theoretical literature states that indexing is a macroeconomic policy instrument, and its effectiveness and advisability depend on an integrated view of a country's stabilization goals, sensitivity to fluctuations in financial markets, and linkages with foreign economies. Recent international experience shows that the relationship between indexing policy and inflationary dynamics varies among different countries. While disinflation may be enhanced by a reduced degree of indexing for wages or assets, there is need to spell-out the timing and sequencing of disindexation in the design of a stabilization program.

## **RESUMEN**

Este trabajo revisa la literatura sobre la indexación como instrumento para las políticas de estabilización durante la última década. La primera parte del trabajo focaliza los efectos de la indexación salarial sobre la estabilidad macroeconómica y las ventajas comparativas de la indexación de la política cambiial. La segunda parte presenta una revisión de las experiencias internacionales recientes con la indexación. La literatura teórica afirma que la indexación es un instrumento de la política macroeconómica y que su eficacia depende de una visión integrada de las metas estabilizadoras del país, de la sensibilidad a las fluctuaciones en los mercados financieros y de las vinculaciones con las economías de otros países. La experiencia internacional reciente demuestra que la relación entre la política de indexación y la dinámica inflacionaria varía entre los diversos países. La desinflación puede ser acentuada por un grado reducido de la indexación de los salarios o los activos, pero se precisa explicitar la secuencia de la desindexación en la formulación del programa de estabilización.



## I. INTRODUCTION

A dozen years have passed since Milton Friedman (1974) and Herbert Giersch (1974) called for the use of full indexation as an instrument for promoting macroeconomic stability and reducing inflation. Since then, indexing has been a subject of continuing discussion in the theoretical literature of Macro and International Economics. In the various national experiments with indexing as a stabilization instrument, the results have not always conformed to theoretical projections. For example, in Israel, wage indexing has been accepted as a necessity in order to reduce the distortions of high inflation. On the other hand, it has also been blamed for prolonging inflation and perhaps also 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 gradual or discontinuous 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. However, with the stagnation during the first half of the 1980's, the effects of disindexation were swamped by other factors.

The questions that provide the orientation for this review of the literature in indexation address both the evolving theory of indexing and the broadening experience of different national economies with various partial experiments in using indexing for macroeconomic stabilization purposes.

What lessons can we learn from recent theoretical developments and international experiences? Research has focused on the "optimal" degree of

wage indexing, the proper price indicators to use in a wage adjustment rule, and the comparative advantages of wage indexing rules and exchange rate intervention policies. Is there an emerging consensus view, despite disagreements on some issues? What further research needs to be done, if there is to be a fruitful matching of theoretical work with historical/empirical studies for better policy formulation?

The next section of this paper briefly summarizes the historical antecedents of the Friedman and Giersch proposals for indexing. Section III is a review of theoretical developments on wage indexing and macroeconomic stability and the comparative advantages of indexing and exchange rate policy. The fourth section surveys the international experiences with indexing during the same time span. Finally, section five is the conclusion. It contains an analysis of how well theoretical developments have matched recent international experience, and provides an agenda for further research.

## II. HISTORICAL ANTECEDENTS

Indexing proposals for wages and assets 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 a fully-indexed 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].

The discussion of indexing continued in the period from Fisher to Friedman and Giersch. In the 1940's and early 1950's Finland and Israel adopted widespread wage and asset indexing while in Germany the Currency Act of 1948 prohibited indexing. During this same period, indexing research concentrated on the potential of indexing policies for reducing the distortions of inflation as well as its potential to reduce the will to fight inflation. What was new about Friedman and Giersch was not their proposal to adopt indexing in an inflationary environment, but their proposal to use indexing as an instrument for reducing inflation.

In their advocacy of widespread indexing, both Friedman and Giersch argued against the "widespread prejudice" that indexing may cause inflation to accelerate, and advocated indexing as a help to stabilization 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 growth of total spending" and will permit this drop to have 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): p. 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 and widely discussed, both in theoretical literature and in the analysis of recent experience. This review will thus assess how well the proposals of Friedman and Giersch have stood the test of the past dozen years with its turbulent international experiences as well as through theoretical developments in macroeconomic modelling.

### III. THEORETICAL DEVELOPMENTS

This part of the review is sub-divided into two sections, one for assessing the effect of wage indexing rules on stability, the other for clarifying the comparative advantages of wage indexing and exchange rate policy in an open economy.

Both closed-economy and open-economy models deal with these related policy questions. The closed-economy models take up one class of issues: should wages be fully adjusted to changes in inflation rates, or is less-than-full adjustment to be preferred, from the perspective of stabilization policy? For analytical convenience, these issues were mostly discussed in the



context of a closed economy, although some open-economy considerations affect the discussion of modified price indicators in indexing rules. Another class of issues is the comparative advantages of alternative indexing policies, which control wages, and exchange-rate intervention policies, which control exchange rates, from the point of view of stabilization policy goals.<sup>1/</sup>

It should be recognized that at the time that Friedman and Giersch made their proposals for indexing, macroeconomic modelling itself was undergoing a shift in framework. The development of small stochastic macro models with rational expectations had provided an obvious "starting point" after Friedman and Giersch for investigating the effectiveness of indexing as a stabilization instrument in the closed-economy, while the asset market models of exchange rate determination became the new setting for indexing studies in the open economy. It will thus become apparent that the relevant new insights as well as the critical limitations of the indexing literature in the past decade are, in many cases, direct results of the rational expectations/asset market modelling assumptions. It will also become apparent that judgement on the indexing literature has to be, in part, a judgement on the broader macro modelling literature.<sup>2/</sup>

A. Wage Indexing Rules and Stability

The central question of the literature on indexing during the past decade is straightforward: should wages be fully indexed to consumer price changes, even in an economy subject to real as well as nominal shocks? If not, how does one determine this lower degree of indexing? Is it better to adopt a multivariate rule, whereby wages may be fully indexed to price changes, but negatively indexed to other variables, or to fully index wages to

"modified" price indicators? On the other hand, if there is full indexation of assets, is it redundant to adopt wage indexation? Finally, can indexation of the tax system work at cross purposes with indexation of wages?

The literature tells us that yes, it is preferable to index wages partially, rather than fully, to price changes. It may even be better to adopt a multivariate indexing scheme, or to use modified price indicators in the wage rule. In any case, the optimal indexing rule is complex. Asset indexation makes wage indexing redundant only under very strong assumptions. Finally, tax indexing may work at cross-purpose with wage indexing, and policy-makers should not proceed to index all sectors simultaneously.

An underlying issue in all of the indexing literature is the role of the government. Does the optimal degree of indexing emerge without government intervention, or is explicit intervention needed? Finally, does the effectiveness of indexing depend on expectations, and can abrupt indexing (disindexing) policy switches be used to enhance the credibility of stabilization programs, and speed up the disinflation process?

The literature tries to make a case for non-intervention of the government but it is not clear if the optimal degree of indexing will emerge in the absence of intervention. Finally, it is clear that indexing can play a role in enhancing policy credibility, but the timing and sequencing of indexing policy in the design of stabilization programs needs further elaboration and clarification.

The following subsection summarizes the contribution of recent literature on the determination of the "optimal degree" of indexing, optimal wage rules, and optimal price indicators for these rules. Following this, there is a summary of the literature on the interaction of wage indexing with

asset and tax indexing. Finally, the last subsection summarizes the discussion of the role of government intervention in the indexing of wages.

#### A.1 The Determination of Optimal Wage Indexing

The fundamental models for wage indexing are the Gray (1976) and Fischer(1977) models. These models are small stochastic models with rational expectations and labor contracts based on pre-set wages. They 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.<sup>3/</sup> Gray's result comes from minimization of a loss function, based on the deviation of output under indexing from output in a "frictionless" economy with flexible market-clearing wages. 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 output or price variability on individual utility are not explicitly treated and 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 these models. It is not at all clear what kind of optimal indexing arrangement would emerge in this kind of framework.

The implication of the Gray/Fischer models--that 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. The reason for less-than-full indexation is straightforward. A real shock reducing

output and raising prices will reduce the demand for labor. If real wages do not change, employment and production will fall further. However, if real wages fall through partial indexation, the output/employment reduction will be lessened. In this sense, partial indexation stabilizes the output effects of real shocks.

Cukierman (1980), however, provided one major caveat to the Gray/Fischer approach. If the employment role is supply-rather than demand-determined, and if labor supply is highly responsive to the expected real wage, then full indexation of wages reduces uncertainty in real wages and thus may stabilize labor supply. With less fluctuation in labor supply, output fluctuations may be reduced, even in the face of real shocks. In this case, partial indexation may curtail the supply of labor and increase output instability.

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 there 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 rules to policy reaction functions.

Later, Pazner (1981) and Karni (1983) proposed an unrestricted rule in Blanchard's sense: full indexation of wages to the consumer price level, and negative 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.

As an alternative to extended wage indexing rules, Marston and Turnovsky (1985) have proposed an indexation/taxation scheme which achieves the same objectives as the Karni extended wage indexing rule. The Marston/Turnovsky scheme ties wages to the aggregate price level alone, whereas the tax is levied on a firm's revenue and contains a credit for labor use. Marston and Turnovsky point out that this scheme "modifies the firm's response to the productivity disturbance, inducing the firm to produce the same output as in an a benchmark (frictionless) economy" [Marston and Turnovsky (1985): p. 22]. The wage indexing parameter in this scheme is less than one. Both the wage indexing parameter and the tax parameter depend upon the supply elasticity of labor and the elasticity of labor in the production function [Marston and Turnovsky (1985): p. 22].

An alternative to partial indexing of wages to the consumer price level or to the use of extended wage rules is to have full indexation of wages to modified price indicators, which net out the effects of real shocks from the price indicator in the wage adjustment rule. Turnovsky (1983), Marston and Turnovsky (1982), Aizenman (1983a) and Marston (1983) have examined this issue in greater detail. Turnovsky (1983) called for "indexing wages not to the consumer price level (CPI), but to the price of domestic output (GNP deflator). For an open economy, this restriction is one form of disindexation.

Marston and Turnovsky (1982) proposed 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 the use of a basket indicator in the wage rule, which links wage adjustment to a weighted average of general price level and the relative price of tradeable to non-tradeable goods. The benefits of using a "basket indicator" increase "with the share of traded goods, substitutability 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 from foreign shocks" [Aizenman (1983a): p. 12]. The relative weights for the general price level and the relative tradeable/non-tradeable price ratio come from the minimization of a loss function based on deviations of actual output from desired 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 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 indicators, the weighting scheme is likely to change with openness, production and consumption patterns, and the volatility of foreign shocks. A stable weighting scheme to well-known indicators no longer suffices. The literature thus tells us that optimal indexing is complex -- and that it can take the form of partial wage indexing to consumer prices, extended indexing rules, or the use of modified price indicators in the wage rule.

However, if one posits an information-based rational expectations/equilibrium model with no information asymmetry, 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 wage indexing. From Barro's perspective, then, it is always beneficial to reduce indexing, since (1) indexing is ineffective in reducing output variability, (2) there is no need to have indexing to neutralize monetary shocks, (3) lower indexing will reduce price variability. Barro's work is thus consistent with disindexation policy.

What about an economy subject to recurrent monetary shocks, and no real 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]. Even in the face of monetary shocks, raising the level of

indexing to unity may not help, since some portion of the monetary shocks will be perceived to be real shocks. Gray's results therefore reinforce the support of previous literature for disindexation.

#### A.2 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, "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 and non-indexed bonds as well as perfect capital markets, the optimal degree of wage indexation may be indeterminate [Liviatan (1983): p. 271]. The implication of this literature is that wage indexing may not be necessary if indexed bonds are prevalent in the economy.

A fundamental shortcoming of this approach which views assets and wage indexing as substitute forms of indexing is that it ignores the difference between labor market contracts and asset market contracts. Wage and asset indexing are substitutes under perfect capital markets because workers with non-indexed labor contracts may borrow the value of their income for the coming period through a non-indexed loan and purchase an indexed asset. The loan can be repaid with the earned income at the end of the period. However, this view of indexing substitutability neglects the fact that a labor contract does not guarantee income for a given period, but only a nominal wage for a given period. There is always the possibility of a lay-off and loss of income under a labor contract, while an asset, with or without indexing, guarantees payments. So it is not at all clear how wage and asset indexing can be substitutes, unless workers have perfect certainty that there



will be no lay-offs or downturns in the labor market.<sup>4/</sup>

The basic reasons for asset and wage indexing are thus quite different. Bond indexing is first and foremost a technique of the government to facilitate its open market operations. By assuming the risks, the government can compete in the capital market and manage to sell its bonds. Wage indexation, on the other hand, is made primarily to facilitate wage negotiations and prolong contracts.<sup>5/</sup>

A final 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 made for disindexation of wages in an economy with indexed assets.

Apart from the question of substitutability, the question remains if the introduction of asset indexing could destabilize an otherwise stable system, with or without wage indexing. Fischer (1983a) found that bond indexing destabilized an otherwise stable system if the ensuing budget deficits generated by the indexed interest obligations were financed by money creation. However, Fischer emphasized that this link between bond indexing and instability is "not inevitable but a matter of choice" [Fischer (1983a): p. 541]. However, if government does index its bonds, time inconsistency may make it difficult for the government to avoid the destabilizing consequences

of this form of indexation.

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. Thus, with a demand shock, indexed taxes eliminate the stabilizing effects of higher nominal tax brackets on disposable income, which help reduce demand. It is thus destabilizing to index the tax system for an economy subject to recurrent demand shocks. For supply shocks which change real income, however, tax indexing removes nominal tax bracket effects which may add to demand when the supply shocks are negative and decrease demand when the supply shocks are positive. In this case, tax indexing helps to stabilize the macro system.

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 output effects of monetary shocks, and full indexation if the aim is to reduce the output effects of real supply shocks. 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), for a given structure of disturbances affecting the economy. Bruce's paper also tells us that it is perfectly rational for policy-makers to index one sector of the economy while avoiding indexing 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. Bruce's paper only examined indexation 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 problems in the tax treatment of depreciation and capital gains: (1) the adjustment of historical costs for changes in the general price level; (2) the effect on depreciation accounting of changes in relative prices, and (3) the inclusion in depreciation of accrued capital gains and losses from changes in relative prices [Aaron (1976): p. 11].

The problems of adjusting income, especially 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', 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 burden on old 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 is an area for further development.

### A.3 The Necessity of Government Intervention

The literature so far tells us how the optimal degree of indexing is determined. The question arises if indexing rules should be imposed by specific government intervention, or if such rules should simply be permitted to evolve through private market forces. A case can be made against intervention if one views indexing primarily as an arrangement which permits long term contracts. On the other hand, if one views indexing as an instrument for stabilizing the economy, then there is a case for government intervention.

Indexing would not be necessary, of course, if recontracting were costless. The relationship between indexing and the duration of contracts is of fundamental importance. To investigate the consequences of indexing without considering the alternative of short-term contracts is akin to discussing demand without reference to price<sup>6/</sup>

Gray showed that for any degree of indexing, contract length will decrease with the level of uncertainty and increase with 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 thus 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 with 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].

On the other hand, intervention through an imposed indexing rule can be an important source of information to economic agents about policy regime changes of the government, and thus could be a useful instrument of stabilization policy. Suppose that a high degree of indexing has evolved through market forces during periods of high and variable inflation. If the government intervenes with a rule forbidding all indexing, or cutting the degree of indexing, and if this rule is coupled with a monetary/fiscal program aimed at lowering inflation, then this indexing intervention might enhance the credibility of the stabilization program, speed-up the disinflation process, and thus reduce the output costs of lowering inflation. In this case an explicit government disindexation rule coupled with monetary/fiscal policy changes may help bring about a "regime change" in Sargent's sense, in which inflation is eliminated "very rapidly and with virtually no Phillips-curve costs in terms of foregone real output" [Sargent (1983): p. 57].

Whether intervention in the form of rules for reducing indexing is needed to make disinflation programs work more effectively and more rapidly and whether the disindexation rules for wages (or assets) should be abruptly imposed or gradually phased-in, are issues which have not been resolved during the past decade. Since monetary/fiscal changes aimed at lower monetary growth and balanced budgets usually take time, while indexing rules may be imposed relatively quickly in the absence of legislative delays, perhaps the monetary/fiscal changes should precede the imposition of indexing rules in such a stabilization program.<sup>7/</sup> However, the section below on international experience shows that there have been many experiments, but few successes with indexing intervention rules in stabilization policies. There is a need to spell out the timing and sequencing of indexing intervention rules with monetary/fiscal policy changes in the design of a disinflation program.

B. Exchange Rate Policies and Indexation

In the open-economy context, research has concentrated on one basic question: how does exchange rate policy affect the use, optimal degree and effectiveness of wage indexing? After all, both wage and exchange rate policies affect nominal variables, and both may be adjusted to help stabilize real variables for various types of shocks. Do these policies have comparative advantages? Is it better to have fixed or flexible exchange rate system with wage indexing? If monetary policy reacts to foreign and domestic shocks as well as exchange rate targets, how does this type of policy responsiveness affect wage indexing? Finally, are the welfare gains from optimal wage indexing reduced if there is sticky price setting behavior, and thus significant deviations from PPP in an open economy?

The literature tells us that a system of flexible exchange rates with partial wage indexing is preferable to a fixed system with full indexing. The relationship of monetary feedback rules for exchange rates with wage indexing is more complex; both may serve to promote stability, and both have comparative advantages for various types of disturbances affecting the economy. Finally, deviations from PPP in the form of sticky price setting may considerably reduce the benefits of optimal wage indexing rules.

In the discussion of exchange rate policy and indexing rules, 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.<sup>8/</sup> Such rules belong to the same species of economic phenomena as the gold standard and other money supply rules. Thus, it may appear a bit artificial to discuss these two applications of indexing

in the same context, in a symmetric framework, since there may be different time lags in changing money supply rules and wage indexing arrangements. This symmetric treatment of wage indexing and exchange rate policy is a principal drawback of much of the professional discussion of wage indexing in the international context.

The following subsection summarizes the relevant literature on the effects of fixed and flexible exchange rates on the optimal degree of indexing. Then the relation of monetary policy reaction functions to wage indexing is examined in the second subsection. Finally, the last subsection treats the effectiveness of indexing under sticky prices and PPP-deviations.

#### B.1 Indexing and the Choice of Exchange Rate Regime

Flood and Marion (1982) and Marston (1982) examined the relationship between wage indexing and the choice of exchange rate regime. Both papers 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].

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 difference," 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 at home is lower 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].

Finally, Aizenman (1984) considers the choice of exchange rate system and its relationship to indexing indirectly, by considering the determinants of recontracting frequency. He found that the optimal degree of indexing depends on the "relative importance of real and monetary shocks" whereas the "optimal frequency" of recontracting depends on "aggregate volatility" [Aizenman (1984): p. 257]. With respect to aggregate volatility, the optimal degree of indexation is homogeneous of degree zero and the optimal frequency of recontracting is homogenous of degree one [Aizenman (1984): p. 257].

The results of Aizenman pinpoint two decisions, the degree of indexing and the frequency of recontracting, in a single optimizing framework. A high degree of indexing does not necessarily go hand in hand with less frequent recontracting, nor does a low degree necessarily mean more frequent



recontracting. However, the social costs of frequent recontracting are one of the principal costs which indexing arrangements attempt to minimize. Thus if a high degree of indexing does not lead to less frequent recontracting, because it does not lower aggregate volatility, then other policy choices should be taken which lower this volatility. Aizenman shows that the choice of exchange rate regime plays a major role in the indexing/ recontracting decision, because this choice can affect the "aggregate volatility" of the economy, and thus the frequency of recontracting.

If there is a higher degree of variability in foreign prices and real shocks, Aizenman sees flexible exchange rates as "more desirable", because the exchange rate adjustment "mitigates the effects of these shocks" and thus would reduce aggregate volatility and the need for more frequent recontracting [Aizenman (1984): p. 260]. On the other hand, if there is an increase in the variability in domestic money or foreign interest rates, then the "relative desirability" of a fixed rate system increases, because "fixed rates isolate domestic output from the volatility of foreign interest rates and domestic money supply" and thus, in this circumstance, reduce aggregate volatility and recontracting frequency [Aizenman (1984): p. 260]. Thus, the choice of exchange rate regime with the optimal indexing arrangement depends on the underlying cause of aggregate volatility.

## B.2 Monetary Policy Responsiveness and Wage Indexing

Cardoso (1981), Leiderman (1982), Turnovsky (1983), and Aizenman and Frenkel (1985), 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 accommodating 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 accommodation 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 consequent feedback effect of past inflation on current inflation while Leiderman deals with the ensuing feedback effects of exchange rates upon current inflation. Thus the advisability of indexing critically depends on the monetary regime being followed. Cardoso and Leiderman demonstrate that full wage indexation and accommodating monetary policy are not consistent with price stability.

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 accommodates 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 intervention 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 "stabilizing" intervention rule. These papers show that indiscriminate indexing policy, which ignores these restrictions, 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.

Finally, Aizenman and Frenkel (1985) 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 (1985): p. 412]. However, they also point out that the

use of only one variable, the general price level, in the wage rules 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 (1985): p. 412]. 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 (1985): p. 412]. 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 (1985): p. 412].

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 targets, 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 policymakers and achieve further details. However, 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.

### B.3 Indexing with Sticky Prices and PPP-Deviations

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 "price 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 flexible 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 put 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 cautious attitude toward the use of indexing in the open economy context, especially in a system of flexible exchange rates, where there is a high likelihood of deviations from PPP.

Table 1 presents a summary of the information and insights in the closed and open-economy theoretical literature on indexing. The column in the left side lists the conditions which would lead to a lower "optimal level" of indexing, whereas the column on the right side lists the conditions which would lead to a higher "optimal level." The middle column lists some of the conditions which leave this optimal level indeterminate.

Table 1 shows that a relatively high degree of wage indexation is compatible with monetary shocks, perfect information, low tax indexing, non-accomodating monetary policy, and fixed changes rates. This relatively higher degree would also be compatible with real shocks but only if the employment rule were supply-determined. Low indexing, on the other hand, is compatible with productivity shocks, information confusion, an indexed tax system, accomodating monetary policies, and flexible exchange rates with real shocks. Finally, the optimal degree of indexing is indeterminate under rational expectations/market clearing equilibrium conditions or under full asset indexing and perfect capital markets. It will become apparent in the succeeding section that the more "realistic conditions" for indexing arrangements, in recent experience at least, appear on the left-side of Table 1, and match up in theoretical models with a relatively low optimal level of indexing.

TABLE 1

SUMMARY OF THEORETICAL WAGE INDEXING INTERRELATIONSHIPS

Optimal Degree of Indexing:

LOW	INDETERMINATE	HIGH-UNITARY
<u>Macroeconomic Conditions:</u> Real Shocks	--	Monetary Shocks
Monetary Shocks and Imperfect Information		Monetary Shocks and Perfect Information
	Rational Expectations/ Mkt. Equilibrium Conditions	
Real Shocks and Employment Rule Demand- Determined		Real Shocks and Employment Rule Supply Determined
	Full Asset Indexing and Perfect Capital Markets	
Real Shocks and High Tax Indexing		Monetary Shocks and Low Tax Indexing
Accommodating Monetary Policy to External Shocks		Non-Accommodating Monetary Policy to External Shocks
Flexible Exchange Rates and Real Shocks		Fixed Exchange Rates and Monetary Shocks

V. 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 (Fischer (1983b): p.3., Simonsen (1983): p.119)]. A comparison is of interest because of the different ways in which indexing policies were introduced and have evolved in each country.

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 level 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 a 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 wages 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 disappear in Brazil [Resende and Lopes (1981): p. 615].

The resistance 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 (1978), on the other hand, has presented time series/spectral evidence which calls into question any relationships between inflation feedback and the indexing system in Brazil. More recently, Arida and Lara-Resende (1985) 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 \$12.5 billion surplus in the current account for 1984 and a low fiscal deficit, 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 (1985): p. 29]. However, the Arida/Lara-Resende disindexation proposal calls for a currency reform involving a new indexed money during the transition period. [Arida and Lara-Resende (1985): p. 38]. [See the Appendix of Arida and Lara-Resende (1985): 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, "had 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 loans to the U.S. dollar exchange rate, after a 67% devaluation in 1961. Brenner and Patinkin (1977) state that the "public outcry was immediate" after debtors had the "traumatic experience" of finding that their nominal debt to the government 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 1979. However during the period between 1973-77 inflation jumped to high levels, and government receipts from loan repayment fell substantially in real terms. This became known as the "inflationary subsidy embodied in government loans" or simply the "credit subsidy" [Liviatan and Piterman (1984): p. 5]. Liviatan and Piterman point out that the "significant aspect" of this credit subsidy between 1973-77 was that it was not financed by taxes but "mainly by increasing the net government debt" [Liviatan and Piterman (1984): p. 5]. By the end of 1983, government debt to Israeli citizens grew to 115 percent of GNP, from about 50% in 1970 [Liviatan and Piterman (1984): p. 8]. Most of these government bonds are indexed, and most of the assets held by the private sector are intermediated indexed liabilities. By 1983, according to Fischer, 83% of the financial assets held in Israel were indexed "either to the price level or the exchange rate" [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 Israel 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 recommendations, 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 appropriate deflator. Fischer argued against this alternative, 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 defense 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 have "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 currently 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 (1985) 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 (1985): p. 47].

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

In the past decade Argentina, Chile, and Uruguay have implemented policies of exchange rate preannouncement and wage disindexation. These policies formed part of an overall 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?

B.1 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 principal means of cutting public-sector deficits in the mid 70's [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 wage indexing 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 Rodriguez (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 stability in the financial sector.

## B.2 Chile

In contrast to Argentina, Chile had 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 in 1977-78 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 wage 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.

### B.3 Uruguay

As in 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 WPI inflation rate to the exchange rate preannouncing occurred 24 months after the start of the program [Hanson and de Melo (1984): p. 45.] During this 24-month period the economy underwent a boom and then a severe recession. Uruguay had to abandon the tablita in 1982.

Some of 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" as Uruguayans transferred their demand to Argentina. [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 policy 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.

#### B.4 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, since wage linkage was considered the main factor for the "propagation of the inflationary impulses from abroad" [Linnamo (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 (1974): p. 23].

After Finland abolished indexation, 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].

As for Iceland, since 1939, indexation of all wages and salaries had been the general rule, whereas indexed bonds were fully permitted since 1979. Since the early 1980's, inflation accelerated to rates in excess of 100%, while GNP dropped by 2% in 1982 and 5.5% in 1983. Sigurdsson (1985) reports that the increase in the Cost of Living Index between February and May 1983 was equivalent to 132 percent at an annualized rate [Sigurdsson (1985): p. 110].

After the general election in May 1983, indexing was suspended the same day that a devaluation was announced. The new program prohibited wage indexing until May 1985. However, Sigurdsson (1985) reports that the government maintained indexation in the financial system in order to "stimulate financial savings in the face of a serious external deficit" [Sigurdsson (1985): p. 112]. The government also gave commercial banks a "freer hand" to set interest rate in the summer of 1984 [Sigurdsson (1985): 112].

Sigurdsson (1985) reports a significant accomplishment as a result of the abrupt disindexation of wages in Iceland. 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 [Sigurdsson (1985): p. 112]. Sigurdsson (1985) concludes

his analysis of the Icelandic experience by stating that disindexation is probably necessary for a "rapid suppression of internal inflation" [Sigurdsson (1985): p. 115]. While a high degree of indexation may stabilize success, "it also aggravates failure," and since "failure is more common than success," he recommends that Iceland continue without wage indexation [Sigurdsson (1985): p. 116].

C. Western Europe, Canada, and 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?

C.1 Western 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].

Indexing in Europe also plays a part in the debate about the reasons for the relatively slower recovery in Europe than in the United States after

1983. One explanation for the relatively slower European recovery is that real wages are relatively more rigid, less flexible than in the United States. This relatively stronger rigidity, of course, is partly due to the more widespread use and higher degree of index linking in Europe. Sachs (1983) pointed out that in the United States "nominal wage growth is well described as a function of unemployment and a distributed lag of changes in consumer prices" while in Europe "the link between changes in wages and consumer prices is virtually instantaneous" [Sachs (1983): p. 275]. In order to promote "faster demand expansion" in Europe, Sachs calls for "social contracts between governments and trade unions" aiming at "moderation of real wages" [Sachs (1983): p. 286]. Sachs singles out the reduction in indexing in Belgium, Denmark, France, and Italy in 1982 as models for the rest of Europe.

## C.2 Canada and the United States

Canada and the United States have a similar approach 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 was 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 seem 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) relationship 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. Two 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, Fischer (1983a) presented a simple cross section study of 40 countries designed to determine the effects of various forms of indexation on inflationary adjustment. What Fischer used as the dependent 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.

For purposes of single-equation estimation and analysis, Fischer's classification of the independent indexing variables had to be 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 of 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.

Table 2 summarizes some of the recent international experience with indexation for wages and assets, and exchange rate policy. This table also presents the results of the various stabilization programs implemented in these countries. Only two countries (Finland and Iceland) appear to have had success with disindexation as a stabilization policy instrument.

Table 2 indicates in a striking way what should be clear from the theoretical literature and recent experience. Little is known about the optimal way to implement indexation or disindexation as part of an overall stabilization program. Despite the tremendous practical and political importance of indexing, the literature so far has given little guidance to policy-makers.



Table 2

Summary of International Experience with Indexing as an Instrument  
of Stabilization Policy

Country	Wage Indexing Policy	Exchange Rate Policy	Asset Indexing	Stabilization Policy Results
Brazil	Full indexing with fixed frequency	PPP-rule	Full indexing by regulation	Higher but non-explosive inflation.
Israel	Lower indexing but shorter frequency	PPP-rule	Widespread	Higher levels and acceleration of inflation.
Argentina	Indexing permitted	Preannouncement in late 1970's	Permitted	Higher levels and acceleration of inflation.
Chile	Disindexing during the mid-70s	Preannouncement in late 1970's	Permitted	Recession and collapse of industrial output.
Uruguay	Indexing Permitted	Preannouncement in late 1970's	Permitted	Recession and higher levels of inflation.
Iceland	Abolishment of wage indexing	Fixed system	Permitted	Reversal of inflation after 1983
Finland	Abolishment of wage indexing	Fixed system	Abolishment of asset indexing	Reversal of inflation in early 1970's
U S A	Permitted	Flexible system	Permitted	Low inflation after recession
Canada	Permitted	Flexible system	Permitted	Low inflation.
Europe	Coordination of disindexation policy	Fixed system	Permitted	Stagnation and inflationary persistence.

## VI. CONCLUSIONS

This paper has reviewed theoretical developments and international experience with indexing during the past decade. Is there any evidence that these theoretical developments match-up with some recent historical developments and thus can serve as a basis for fruitful policy analysis? Have theoretical insights been reflected and tested in institutional adjustments or historical studies of indexing? What further theoretical and/or empirical work needs to be done? Finally, is there an emerging consensus view of indexing in the literature of the past decade?

The movement toward 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 predict or account for recent international problems? Here, too, there is evidence of correspondence between theory and experience. 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 by recent theoretical developments.

Still, much more theoretical and empirical work needs to be done. It is clear that many countries are not optimally indexed. Yet there is little information about how a country can move from a sub-optimal over-indexed situation to a lower-indexed (and thus more stable) situation. The adjustment costs have not been spelled out well, nor 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 disastrous 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. The role of currency reform in a disindexation/disinflation process, as recently proposed in Brazil, has also not been well developed in the literature. 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.

Furthermore, the data and information from recent disindexation in Argentina, Chile and Uruguay experiences may also reveal a great deal about the effects of wage and exchange rate disindexation "news" on price setting behavior and the effects of these 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 in small open economies.

Despite the widespread discussion and various approaches to indexing during the past decade, there is an emerging consensus view. 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 turn out to be very complex problems. 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.<sup>9/</sup> For countries with high inflation and sub-optimal over-indexed systems, disindexation is now at the center of the research agenda. Thus the call of Friedman and Giersch for full indexation has been reversed. The call is now for disindexation.

FOOTNOTES

1. Closed and open-economy models simply provide a division of labor for investigating policy questions related to indexing. In the closed-economy models, the optimal degree of indexing is estimated in relationship to domestic monetary and real disturbances (such as a change in productivity). In open-economy models, indexing is examined in relationship to exchange rate intervention policy for money-supply processes, as well as in relationship to foreign and domestic disturbances. The open-economy literature thus gives a more detailed specification of money supply changes and a more detailed classification of the shocks affecting the economy. In this sense, the closed-economy literature is less complicated, and thus more suitable for the beginning of this survey. It does not mean that the insights of closed-economy models are irrelevant for indexing in open economies. It simply means that questions of exchange rate policy and foreign disturbances are not explicitly treated.
2. In rational expectation models, the expected rate of inflation is treated as a forecast of the model using all the information available to the agents up to the current period. Thus, the expected rate of inflation is dependent upon the model under consideration. A test of rational expectations is thus a joint test of rational expectations and the model under consideration.
3. The classification of random shocks as real or productivity and nominal or monetary is used frequently. "Real", "productivity" and "supply" shocks are virtually interchangeable. The same is true for "nominal", "monetary"

and "demand" shocks. In this paper, the terms real and monetary will be used to distinguish these two types of shocks.

4. Jurg Niehans made this point in private conversation.
5. David Bigman made this point in private correspondence.
6. Jurg Niehans made this point in private correspondence.
7. Jacob Frenkel raised this point in private conversation.
8. Jurg Niehans made this point in private correspondence.
9. Jurg Niehans made this point in private correspondence.

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