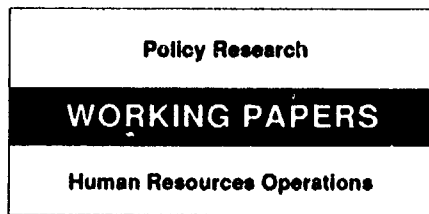


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Do Workers in the Informal Sector Benefit from Cuts in the Minimum Wage?

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That depends. Standard economic wisdom is this: cuts in the minimum wage increase employment in the formal sector, thus reducing the effective supply of labor to the informal sector and increasing the income of workers in the informal sector. But in a more complex model, cuts in minimum wages do not always improve standards of living in the informal sector.



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The paper analyzes the effect a change in the minimum wage has on the earnings of workers in the informal sector who are supposedly not covered by minimum wage legislation. The standard view is that reducing the minimum wage, which increases employment in the formal sector, reduces the effective supply of labor to the informal sector, increasing the wage in the informal sector.

But Fiszbein argues that the effect of the minimum wage on earnings in the informal sector does not depend exclusively on its effect on labor mobility between the formal and informal sector. Demand for goods also links the two sectors — and this demand is seldom factored into theoretical discussions.

Based on a general equilibrium approach, Fiszbein builds a dual economy model in which the two sectors are linked not only through the labor market but also through the goods market. In this framework, reducing the minimum wage

affects informal sector earnings both through changes in labor productivity and changes in relative prices. Once these two factors are considered, a minimum wage cut could result in reducing informal sector wages, even if formal sector employment increases.

If workers in the formal sector are the main buyers of the goods produced in the informal sector, and their income elasticity of demand is relatively large, workers in the informal sector could be hurt by a cut in the minimum wage. They could similarly be hurt if the informal sector employs a large part of the urban labor force, and if demand for the goods produced in the informal sector is price-inelastic.

Fiszbein's model, however, does not affect the case for cuts in minimum wages on the grounds of efficiency. Reducing the minimum wage does increase jobs and output in the formal sector.

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INTRODUCTION

In this essay I will analyze the effect of a change in the minimum wage on the earnings of workers in the informal sector, who supposedly are not covered by minimum wage legislation. The standard view of the matter is that a reduction of the minimum wage, which increases employment in the formal sector, reduces the effective supply of labor to the informal sector increasing the wage at which the latter clears.

Strong policy conclusions can be - and have been - derived from the standard view. Given that workers in the informal sector earn less than those in the formal sector, a reduction in the minimum wage should reduce income inequality between workers in the two sectors. Also, to the extent that most of the urban poor work in the informal sector, reducing the minimum wage could be an effective anti-poverty policy.

The possibility of a positive correlation between minimum wages and informal sector earnings has been

previously discussed in the literature. Mincer [1976] showed that, when the possibility of some workers queuing for formal sector jobs is considered, the direction of the effect of changes in the minimum wages on informal sector earnings cannot be determined a priori. In this essay, I explore the possibility of a non-standard result following a different avenue. In Mincer's approach, a non-standard result is associated with a large reduction in unemployment. Here, I will discuss the role of demand-factors, rather than supply factors, in generating a non-standard result. This view of the matter, I suggest, is more likely to provide a more general explanation of some patterns observed among Latin American countries.

The essay will be organized as follows. Section 1 will review the literature on the impact of minimum wages on inequality. Section 2 will discuss the role of labor reallocation and demand factors in determining the relationship between minimum wages and informal sector earnings. In section 3 the model will be developed. Conclusions will be discussed in section 4.

1. MINIMUM WAGES AND INCOME INEQUALITY.

Minimum wage policies are controversial among economists and policy makers both in developed and less developed countries. Critics and supporters have debated the effectiveness and desirability of such policies with little agreement.

Minimum wage laws are viewed as playing diverse roles. Supporters usually justify minimum wages as a distributive tool, that is, as an adequate way of improving the living conditions of the poor, the unskilled, and the un-organized workers (Starr [1981]). In many LDCs minimum wages are expected, in addition, to provide an acceptable minimum standard of living for all workers (Watanabe [1976]).¹ Critics, on the other hand, emphasize the efficiency losses associated with their use, and disqualify them as an adequate way of affecting inequality.

Economic theory, however, has not been extremely successful in determining the distributive effects of minimum wages. The ambiguity of the conclusions derived from most theoretical analyses arises from the fact that minimum wages affect income inequality in a variety of ways. The impact on

¹In Mexico, for example, the federal constitution states that "The minimum wage to be received by a worker shall be that which is considered sufficient, according to the conditions of each region, to satisfy the normal needs of his living, education and honest pleasures, considering him as head of a family" (cited by Starr [1981], p.3).

those workers directly affected by changes in the minimum wage might be overshadowed by a number of indirect effects.²

A variation in the minimum wage can induce changes in the wages of workers earning more than the minimum wage³, as well as the earnings of those not covered by the legislation. It could also lead to changes in the aggregate level and skill composition of employment by those firms or sectors that are covered and abide by the legislation. As a result, changes in open unemployment and reallocation of labor between the covered and uncovered sectors could result. Furthermore, the size of the labor force itself might be affected in those circumstances. As a result, analyzing the distributive impact of minimum wages implies quantifying all these effects, a task that requires the use of complex general equilibrium models.⁴

²See for example U.S. Minimum Wage Study Commission [1981] (volume 1).

³As long as there is the possibility of substituting workers with different levels of skills, an increase in the minimum wage could induce an increase in the demand for relatively skilled workers, inducing an increase in their wages. Also, the existence of some type of wage-comparison mechanism linking the wages of different categories of workers could result in spill-over effects (Grossman [1983]).

⁴A few of such models have been built for the case of the United States. See for example Cox-Oaxaca [1981, 1984], Johnson-Browning [1983] and Wolf-Nadiri [1981]. A study for Philippines can be found in Rodgers et al [1978].

Minimum wages have recurrently been discussed within the development literature.⁵ The proportion of workers that are in principle affected by minimum wages is larger in developing than in developed countries.⁶ Thus, the potential beneficial and detrimental effects appear to be of a larger magnitude among developing countries. Mainstream development economists have generally argued that minimum wages are one of the principal sources (the other being labor unions) of labor market segmentation, unemployment, underemployment and other labor market distortions typically observed in developing countries.

Starting with Todaro [1969], minimum wages have been seen as generating continuous rural-urban migration in the presence of high open unemployment rates. Minimum wages have also been singled out as one of the important factors explaining the development of the urban informal sector. A minimum wage above the level that would equilibrate the labor market reduces employment in the formal sector, increasing

⁵Minimum wages received prominent attention in Berry and Sabot's [1978] and Squire's [1981] surveys of labor markets in LDCs.

⁶In many Latin American countries, approximately one fourth of the urban labor force earns no more than the minimum wage. For example, the estimates for Chile are 25%, and for Costa Rica, Brazil, and Mexico 30% (see Solimano [1988], Pollack [1989], Maia-Saldanha [1989] and Villareal-Breach [1988]).

the effective supply of labor in the informal sector.⁷ As a result, the informal segment of the labor market clears at a wage below the level that would prevail in the absence of the minimum wage.

This has negative consequences both in terms of efficiency and equity.⁸ In the first place, the allocation of labor is not optimal as the marginal product of labor is not equalized between sectors (Harberger [1971]). This efficiency loss is magnified through time as capital intensive technologies are over-adopted in view of the distorted relative prices. In the second place, only an elite ("labor aristocracy") is able to get the protected jobs, while the rest of the workers are pushed into low-paying jobs. If selection for formal sector jobs is not done on a random basis but on the basis of credentials, personal contacts, and race, minimum wages constitute an important source of economic injustice.

The view arising from such analyses is that minimum wages are too costly for developing countries, and probably unfair to the extent that they favor a small elite at the

⁷The formal sector is identified as those firms that abide by the minimum wage legislation. Throughout this essay the terms formal, covered and protected (informal, uncovered and unprotected) will be used as synonyms

⁸Minimum wages have also been blamed for the existence of poor inter-sectoral labor mobility (Fallon and Riveros [1989]). The growing literature on structural adjustment has pointed out rigid minimum wages in the tradable sector as a cause for the failure of reform attempts (Edwards and Edwards [1990]).

expense of the masses of underprivileged. The obvious policy conclusion is that minimum wages should be eliminated or reduced. A reduction (or elimination) of the minimum wage should, according to this view, increase employment in the formal sector, reduce the effective supply of labor to the informal segment and, as a result, increase the wage at which the latter clears. Thus, a policy of minimum wage reduction can be justified not only on efficiency but also on equity grounds because it improves the economic conditions of the "poor". This policy conclusion contrasts with the suggestions, made by some multilateral organizations, that the earnings of the urban poor (most of whom work in the informal sector) are linked in a positive way to the evolution of real minimum wages.⁹

The importance of this debate transcends the academic community. During the last decade, many developing countries have reversed aggressive minimum wage policies followed throughout the 1950's, 60's and part of the 70's. This trend is notorious among Latin American countries. Among the eleven countries reported in table 1, eight experienced reductions in the real minimum wage of an order of magnitude of 20% to 70% since 1980. The reduction in minimum wages was accompanied by an increase in wage dispersion. In all but one

⁹For example, the International Labour Organization argues that "the earnings from informal activities are liable to follow the tendency of the minimum wage and the increased level of output per informal worker induced by the expansion of expenditure of the modern sector" [PREALC 1987, p.86].

case (Costa Rica, a country in which the real minimum wage increased), the minimum wage fell relative to average manufacturing wages.

Table 1: Minimum Wages in Latin America in 1989 (1980=100)

	Real MW	MW/W
Argentina	77.1	87
Brazil	70.6	67
Chile	79.7	77
Colombia	110.7	93
Costa Rica	116.5	133 (*)
Ecuador	42.3	na
Mexico	50.7	74 (*)
Paraguay	140.6	na
Peru	26.7	72
Uruguay	78.6	79
Venezuela	68.6	na

Source: CEPAL [1989a]. MW = Minimum Wage, W = Wage in Manufacturing, (*) 1988.

Some multilateral organizations have voiced their concern on the negative consequences such policies have on poverty. The International Labour Organization, for example, in its 1987 report said that "unfortunately, in a limited but increasing number of developing countries caution in the adjustment of minimum wages had led to substantial declines in their real value so that they have lost all relevance in

wage determination. Thus, the modest but still significant relevant contribution that minimum wage fixing may make to poverty alleviation throughout the raising of excessively low wages has been lost".¹⁰

In the case of Latin America, the International Labour Organization (PREALC [1987]) and the Economic Commission for Latin America and the Caribbean (CEPAL [1988]) have indicated the need for wage regulations (including minimum wages) in order "to ensure a reduction in inequality and an improvement in the standards of living of urban workers.

Poverty, in fact, has increased in the region during the 1980's. According to Rosenthal [1990] the number of Latin Americans in poverty increased by thirty million throughout the decade, so that the percentage of people in poverty increased from 36% to 38% since 1980. Similarly, in urban areas poverty increased from 21% to 29% in the first half of the decade¹¹. Table 2 shows the changes in poverty in nine of the eleven countries covered in table 1 for which information is available. The percentage of the population under the poverty line increased in all seven countries in which the real minimum wage fell. Only Colombia and Costa Rica experienced reductions in poverty.

¹⁰ILO [1987], vol.3, p.102.

¹¹See Lustig [1990].

Evidence on informal sector earnings is scarce. However, the available information appears to indicate that average earnings in the informal sector changed in the same direction as real minimum wages. Vivancos [1989], for example, found a

Table 2: Poverty in Latin America
(Percentage population under poverty line)¹²

	1980/81	1986/87
Argentina	8.0	13.0
Brazil	17.7	23.3
Chile	14.4	19.2 (c)
Colombia	43.0	38.0
Costa Rica	29.0 (a)	24.0
Ecuador	53.0	55.0
Mexico	48.5	59.0 (d)
Peru	49.0	52.0
Venezuela	12.0 (b)	17.0

(a) 1977, (b) 1982, (c) 1985, (d) 1988

¹²The definitions used are different for each country. Thus, the numbers are not comparable across countries. The information for Argentina, Colombia and Perú were obtained from CEPAL [1985] and CEPAL [1989b]; for Costa Rica and Venezuela from World Bank [1990]; for Brazil from Fox and Morley [1990]; for Chile from Pollack and Uthoff [1989] for Ecuador from Santos [1989]; and for Mexico from Lustig [1990].

reduction in average informal earnings in Venezuela. Lopez and Riveros [1989] found that during the 1980's, wages of informal workers fell in Argentina, Chile and Uruguay; and increased in Colombia. Their evidence for Colombia is confirmed by Reyes [1987] who found that informal wages increased with the minimum wages since the mid 1970's.

The nature of the empirical evidence just reviewed, does not establish the existence of a statistical relationship between minimum wages and wages in the informal sector. The 1980's have been a period of macroeconomic instability in all Latin American countries, during which labor markets were affected in a variety of ways.¹³ More complete data would be needed in order to distinguish the effects of macroeconomic factors on informal sector earnings, from those generated by wage policies.

Nevertheless, the recent experience of Latin American countries with policies of minimum wage reductions, suggests that the nature of the correlation between minimum wages and informal sector earnings is a matter that deserves more attention. The two opposite views of minimum wages that have been discussed, arise from different methodological approaches to the problem. The first approach looks into the effects of minimum wages on the allocation of labor within a framework in which the formal and informal sectors are linked exclusively through the supply of labor. As a result, it

¹³See for example Riveros [1990].

emphasizes the competitive nature of the relationship between formal and informal sector workers. The second approach takes into account the existence of demand links between the two sectors through the goods market, and thus emphasizes the existence of common interests between workers in the two sectors.

In the real world, the formal and informal sectors are linked both through the supply of labor and the demand for goods. Thus, one should expect to find both competition and common interests between the formal and informal workers. In this essay, I will incorporate the existence of demand links in an otherwise standard model of a segmented economy in order to establish the conditions under which one should expect the conclusions of each approach to be valid.

2. THE MINIMUM WAGE AND THE WAGE IN THE INFORMAL SECTOR

The political appeal of recommendations to reduce (or eliminate) minimum wages depends crucially on the wage in the informal sector increasing as a result of the reduction in the minimum wage. The main question to be addressed is thus, what change should we expect in the earnings of those working in the informal sector when the minimum wage is reduced?

A. The role of labor reallocation effects.

Answering this question analytically requires a model of a segmented labor market. The standard approach has been to look at the employment effects of changes in the minimum wage. Such approach indicates that informal sector earnings will increase as a result of a reduction in the minimum wage as long as the effective labor supply to the sector falls.

When the minimum wage is enforced partially (in the formal sector), the supply of labor is fixed, and there is no unemployment, the relationship between the minimum wage and informal sector earnings is necessarily negative. A reduction (or elimination) of the minimum wage should increase employment in the formal sector, reduce the effective supply of labor to the informal sector and, as a result, increase the wage at which the latter clears. The elasticity of labor

demand in both sectors will determine the magnitude but not the direction of the change in the informal sector wage.

Relaxing the assumption of a fixed labor supply does not affect the qualitative results (see Welsh [1974]).¹⁴ However, as Mincer [1976] showed, relaxing the assumption of no unemployment affects the standard conclusion. In Mincer's model, the existence of a non-competitive wage in one sector induces some workers to queue for formal jobs. The equilibrium unemployment rate is obtained from the condition that the net discounted gain from queuing for formal sector jobs equals zero.

A reduction in the minimum wage - the wage in the formal sector - will result in an increase in formal sector employment (the magnitude of which depends on the elasticity of labor demand). The number of unemployed workers, in equilibrium, will also fall as a result of the reduction in the minimum wage. Depending on how large such a reduction is (compared with the increase in formal sector employment) the size of the informal sector can increase or decrease. The direction of the change in informal sector wages depends on the direction of the labor reallocation generated by the reduction in the minimum wage. If the reduction in

¹⁴Welsh established his results assuming the wage-elasticities of labor demand were the same in the two sectors. However, the qualitative results remain the same in the more general case in which the elasticities differ, as long as they have the correct sign.

unemployment is large enough, the wage in the informal sector falls.¹⁵

Mincer provides a potential rationale for the existence of a positive relationship between minimum wages and informal sector earnings.¹⁶ However, such a result is always associated with a reduction in the number of unemployed larger than the increase in formal jobs.

The former, however, does not appear to be a reasonable outcome in the real world. Consider, for example, the case of Mexico. In 1980 the rate of urban open unemployment was 4.5%. If in that year the wage in the formal sector had been reduced by 10%, even if the wage-elasticity of labor demand in the sector were as low as 0.3, the unemployment rate would still have to be cut in half for the non-standard result to occur. If the wage-elasticity was 0.5, the non-standard result would require that the unemployment rate fall below 0.88%.¹⁷ This simple calculation, which could be repeated

¹⁵See appendix 1 for a mathematical presentation of the model.

¹⁶An important question is whether considering heterogeneous labor affects Mincer's results. Abowd and Killingsworth [1981] have extended Mincer's model for the case with two types of labor (low-wage and high-wage workers). In their model, the minimum wage is binding only for low-wage workers in the covered sector. Although the results are more complex, Mincer's conclusions are not affected. Essentially, wages in the uncovered sector would increase with a reduction in the minimum wage as long as queuing is not large.

¹⁷This result was derived taking into account that the formal sector employed 72.4% of the urban labor force.

with similar results for all Latin American countries, casts doubt on the adequacy of the Mincer model to explain a non-standard result.¹⁸

B. The role of demand factors.

The previous is, however, a one sided approach. By looking exclusively at the supply side of the labor market (that is the sectoral reallocation of labor), the standard approach neglects the possibility of changes in the demand side acting in the opposite direction. A more general treatment of the problem should look at labor demand as well as labor supply. Employment opportunities in the informal sector are linked in a direct way to the overall demand for the type of goods and services the sector produces. Thus, assuming that employment opportunities in the informal sector are not affected by the changes that are taking place in the formal sector is acceptable only when the informal sector is autarkic (meaning that it does not "trade" with the formal sector).

The formal and informal sectors are linked not just through the labor market but also through the goods market

¹⁸Cole and Sanders [1985] discuss the validity of Todaro's model using similar numerical exercises.

(Tokman [1978]).¹⁹ Such relations can be represented as trade flows. Cole and Sanders [1985], for example, built a model of migration in which labor flows from one sector to the other in response to trade balance disequilibriums. The scarce evidence available indicates that the informal sector is relatively "open to trade".²⁰ The question then becomes under which conditions will a change in the distribution of income within the formal sector, induced by a reduction in the minimum wage, affect the inter-sectoral trade flows.

Unfortunately, very little is known about the nature of those trade flows. The available evidence appears to indicate that the informal sector exports mainly non-durable consumption goods and services. Tokman [1983], for example, reports that in the case of Chile and Mexico, 70% of such exports are consumption goods and services, the rest being mainly intermediate goods. However, given the characteristics of the informal sector, it is safe to assume such intermediate goods are used in the production of consumption and not capital goods. Thus, it is not unreasonable to characterize informal sector exports as consumption goods.

¹⁹It had been observed that the informal sector both buys and sells consumption and inputs from and to the formal sector. In addition, formal sector firms provide credit to the informal sector. Chaudhuri [1989] offers a recent example of a model in which the formal and informal sectors are linked through the labor, goods and credit markets.

²⁰Tokman [1983], for example, suggests that in Chile and Mexico, the informal sector "exports" approximately half of its output.

The scarce evidence available from a few Latin American countries indicates that low quality consumption goods and services constitute a large share of the informal sector exports, the principal buyers being formal sector workers. A similar view can be found in the 1990 World Development Report in which the informal sector is described as a producer of consumption goods, especially by low-income households (World Bank [1990] p.63). For example, Lopez et al [1987] found that, in Colombia, the demand for informal sector exports is closely related to the wage-bill. There is also some evidence from Latin America indicating that the income-elasticity of the demand for such goods is much higher for low-income than for high-income families (Tokman [1983]).²¹

Under these conditions, a reduction in the minimum wage could reduce the demand for the goods exported by the informal sector and thus reduce employment opportunities in the sector. Camargo [1987], for example, makes this argument when discussing the determination of informal sector earnings.

The final impact on the earnings of informal sector workers will depend on both the changes in the demand for their exports and the induced changes in the sector's terms

²¹Adelman and Taylor [1990] report, in the case of Mexico, higher values of household marginal expenditure propensities for working class families than for capitalists in the case of industry, services and commerce.

of trade. Understanding this process requires a more complete model than the standard supply-side one, a task undertaken in the next section.

3. THE MODEL

In the previous section I discussed the role played by demand factors in determining the effects of a reduction in the minimum wage on informal sector earnings. In this section, a model of a dual economy is built in order to discuss the role of demand factors in an analytical fashion.

The standard approach looks exclusively at the allocational effects of changes in the minimum wage, and the changes in informal sector earnings associated with them. Many economists disagree with the theory of employment underlying the standard approach. In fact, the existence of a negative relationship between wages and employment, crucial in the neoclassical approach, is not an undisputed truth.²² Here, however, I will not dispute the existence of a negatively sloped labor demand function. The possibility of a reduction in the minimum wage reducing informal sector earnings will not be associated with an un-conventional labor demand function.

I will concentrate my attention on a case in which a reduction in the minimum wage generates labor mobility towards the formal sector. By assuming full-employment, the model will disregard the possibility of a reduction in the

²²See Bourguignon [1988] for a survey of the evidence on this matter.

minimum wage resulting in an increase in informal employment, as suggested by Mincer.

The only departure from the standard approach will thus be the existence of market interdependence between the two sectors of the economy, embodied in the assumption that formal sector workers buy goods produced in the informal sector. Whenever possible, I will adopt assumptions which conform with standard models. The segmentation in the labor market will be seen as the result of a non-competitive wage in the formal sector.²³ The informal sector will thus be associated with the "non-protected" and "competitive" segment of the economy.

The model will not necessarily be an accurate picture of the complex links existing between the formal and informal sectors in the real world. In spite of its relatively simple structure, the model generates a variety of results. It also provides a reasonable explanation of what appears to be a paradox for standard models: a reduction in the minimum wage may reduce real informal sector wages.

* * *

Consider an economy in which the formal sector produces a good X using labor (L_f) and capital (K), and the informal

²³This corresponds to what Squire [1981] calls modern sector dualism in opposition to the Lewis [1954] type of dualism, which he calls traditional sector dualism.

sector a good Q using labor (L_1). Good X will be the numeraire ($P_x=1$). Thus Q's price (P) can be seen as the internal terms of trade.

A labor demand function (2) is derived from the maximization of profits, subject to the production function (1) and a given supply of capital, by formal sector firms.

$$X = X[L_f, K] \quad (1)$$

$$L_f = L_f[W_f, K], \quad \frac{\partial L_f}{\partial W_f} < 0 \quad (2)$$

where W_f is the legislated minimum wage which, I will assume, is the prevailing wage in the formal sector.²⁴

The "wage" in the informal sector (W_i) is assumed to be equal to the value of the average product of labor in that sector (q). This treatment implies abstracting from the existence of inequality within the informal sector. Also, this assumption reflects the view of the informal sector as the pool of urban surplus labor, organized on family-based production units.

$$W_i = Pq \quad (3)$$

²⁴In the real world, the minimum wage applies only to the less skilled segment of the formal sector labor force. W_f could thus be seen as the average wage in the formal sector, which is a function of the minimum wage. In that case, the results derived from this model should be multiplied by the elasticity of W_f with respect to the minimum wage, which should be positive and probably smaller than one.

This treatment of the informal sector is chosen in order to maintain the parallel with the standard dual-economy models. If the variable q is seen as the marginal rather than the average product of labor, equation (3) becomes the standard neoclassical condition of wages being equal to the value of the marginal product, and nothing essential changes in the model.

The wage in the formal sector is fixed above the level that would prevail without the minimum wage. Equation (4) reflects the existence of market segmentation. Thus, employment in the informal sector is determined as a residual according to equation (5).

$$W_f > W_i \quad (4)$$

$$L_i = L - L_f[W_f, K] \quad (5)$$

where L is the fixed supply of labor.

The average product of labor in the informal sector (q) is assumed to diminish with the size of the sector's labor force.

$$q = q[L_i] = \frac{Q[L_i]}{L_i}, \quad \frac{\partial q}{\partial L_i} < 0 \quad (6)$$

This behavior would be observed when, for example, the production of Q partially relies on the use of certain public goods (ie: urban infrastructure) which are in a fixed supply,

and the increase in informal sector employment reduces the access to such resources by workers.²⁵

Assume that capitalists (owners of the firms) do not consume good Q. This assumption is meant to reflect the idea, discussed previously, that the informal sector produces consumption goods for low-income households. Considering the more general case in which all individuals consume both goods, would not affect the model (although it would make it more cumbersome) if the marginal propensity to consume Q by formal workers is large enough relative to that of capitalists.

Workers in both sectors are assumed to maximize their utility functions subject to their respective budget constraints. Both X and Q will be considered to be normal goods²⁶.

²⁵If labor were not homogeneous, the average "ability" of the working force could change as a result of changes in its size. If the formal sector employs the "best" workers, average quality of labor in the informal sector should increase as workers are shifted from the formal to the informal sector. In that case we would have increasing, rather than diminishing, labor productivity in the informal sector. Considering this case could have important implications for the results of the model, which will be discussed later.

²⁶This assumption constitutes the basis of the demand-side stories presented in section 2. If Q were an inferior good, the direction of the link between the formal and informal sectors would be reversed.

The maximization problem can be expressed as:

$$\begin{aligned} & \max U [q_j, x_j] \\ & \text{st } W_i = (Pq_i) + x_i \quad \text{for } j=i \\ & \text{st } W_f = (Pq_f) + x_f \quad \text{for } j=f \end{aligned} \quad (7)$$

where q_j is the demand of good Q by a worker in sector j, and x_j is the demand of good X by a worker in sector j. The demands for both goods from workers in both sectors are then derived from the maximization of utilities. Given Walras Law, only one of the two markets (the market for Q) needs to be considered explicitly.

$$q_f = q_f [P, W_f] \quad \frac{\partial q_f}{\partial P} < 0, \quad \frac{\partial q_f}{\partial W_f} > 0 \quad (8)$$

$$q_i = q_i [P, W_i] = q_i [P, Pq [L_i]] \quad \frac{\partial q_i}{\partial P} \Big|_{W_i} < 0, \quad \frac{\partial q_i}{\partial W_i} > 0 \quad (9)$$

Equation (10) represents the equilibrium condition in the market for Q. It is derived under the assumption that workers have identical tastes.

$$L_i q [L_i] - L_i q_i [P, Pq [L_i]] = L_f q_f [P, W_f] \quad (10)$$

Stability in the market for Q requires that the excess demand falls with its price.

$$L_f \frac{\partial q_f}{\partial P} + L_i \frac{\partial q_i}{\partial P} \Big|_{W_i} + L_i \frac{\partial q_i}{\partial W_i} q[L_i] < 0 \quad (11)$$

For simplicity, the price elasticity (defined as positive) will be assumed to be identical for all workers. Using the definitions that follow and equations (10) and (11), the stability condition can be expressed as:

$$-e_p + e_{Yi} \frac{q_i}{q} < 0 \quad (12)$$

where:

$$e_p = -\frac{\partial q_i}{\partial P} \Big|_{W_i} \frac{P}{q_i} = -\frac{\partial q_f}{\partial P} \frac{P}{q_f}; \quad e_{Yi} = \frac{\partial q_i}{\partial W_i} \frac{W_i}{q_i} \quad (13a, b, c)$$

The stability condition (12) is similar to the standard negative price elasticity condition with an additional term that takes into account the expansion in demand arising from the income effect associated with the change in P.²⁷ Notice that the income elasticity of demand is weighted by the average propensity to consume Q.

The real informal wage (WR_i) will be defined as the purchasing power of W_i in terms of the consumer's price index (π).

²⁷The stability condition would not be affected if a more general case were considered, in which different price-elasticities were allowed for formal and informal workers. In that case, however, e_p should be interpreted as a weighted average of the elasticities of informal and formal sector workers, the weights being (q_i/q) and $(1-q_i/q)$ respectively.

$$WR_i = \frac{W_i}{\pi} \quad (14)$$

$$\pi = P^\alpha P_X^{1-\alpha} = P^\alpha \quad (15)$$

Using (14), (3) and (15), the elasticity of the real informal wage with respect to the formal wage (γ) is expressed as the sum of the elasticities of the price (weighted by $(1-\alpha)$) and labor productivity with respect to the formal wage.

$$\gamma = \frac{\partial WR_i}{\partial W_f} \frac{W_f}{WR_i} = (1-\alpha) \frac{\partial P}{\partial W_f} \frac{W_f}{P} + \frac{\partial Q}{\partial W_f} \frac{W_f}{Q} \quad (16)$$

Before deriving the expression for equation (16), define η as the elasticity of labor demand in the formal sector (in positive terms), σ as the elasticity of productivity in the informal sector with respect to employment, and e_{yQ} as income elasticity of the demand for Q by formal sector workers.

$$\eta = -\frac{\partial L_f}{\partial W_f} \frac{W_f}{L_f}; \quad \sigma = \frac{\partial Q}{\partial L_i} \frac{L_i}{Q}; \quad e_{yQ} = \frac{\partial Q_f}{\partial W_f} \frac{W_f}{Q_f} \quad (17a, b, c)$$

Totally differentiating both sides of (10), and using (3), (10), (5), (13c) and (17a,b,c), it is possible to obtain

the following expression for the elasticity of the price with respect to the minimum wage:

$$\frac{\partial P}{\partial W_f} \frac{W_f}{P} = \frac{\left(\frac{q-q_i}{L_f} \right) (\eta L - e_{yf} L_i) + (q-q_i e_{yi}) \sigma \eta}{e_{yi} q_i - e_p q} \frac{L_f}{L_i} \quad (18)$$

From (6), (5), (3) and (17a,b), the following expression for the elasticity of labor productivity with respect to the minimum wage is obtained:

$$\frac{\partial q}{\partial W_f} \frac{W_f}{q} = \sigma \eta \frac{L_f}{L_i} \quad (19)$$

Finally, replacing (18) and (19) into (16), using (10) and rearranging, it is possible to obtain the following expression for the elasticity of the real informal wage with respect to the minimum wage:

$$\gamma = \left[\frac{(q-q_i) (1-\alpha) (\eta L - e_{yf} L_i)}{L_f (e_{yi} q_i - e_p q)} + \sigma \eta + \frac{(1-\alpha) \sigma \eta (q-q_i e_{yi})}{(e_{yi} q_i - e_p q)} \right] \frac{L_f}{L_i} \quad (20)$$

Notice that the stability condition (12) implies that the denominators of the first two terms on the right-hand side of (20) are negative. Thus their signs depend on the numerators.

The first term on the right-hand side of (20) reflects the effect of a reduction in the formal sector wage on the real informal wage when productivity remains unchanged. For reasons that will soon be apparent, I will call it the pure terms of trade effect (PTTE).

The reduction in W_f directly affects the supply and demand for Q in a variety of ways. The first effect is an increase in formal sector employment (the magnitude of which depends on η) and the corresponding reduction in informal sector employment. Disregarding changes in productivity, this effect implies a reduction in the aggregate supply of Q . On the demand side, total demand by formal sector workers can either increase or decrease. On the one hand, this group is larger. On the other hand, their wages have fallen. The final result will depend on whether the elasticity of labor demand is larger or smaller than the income elasticity of the demand for Q .

It is important to notice that there is a scale factor influencing the final impact of a reduction in the minimum wage. A reduction of $x\%$ in W_f will generate an increase of $\eta x\%$ in formal sector employment. When the informal sector is large (relative to the formal sector), the corresponding reduction in informal sector employment will be less than $\eta x\%$. Thus, at constant prices, the sector's surplus (defined as total output minus the consumption of Q by informal sector workers) will also fall by less than $\eta x\%$.

As the size of the informal sector falls (relative to the formal sector), the proportional reduction in its surplus resulting from an $x\%$ reduction in W_f becomes larger (approximating $\eta x\%$ as the employment share of the informal sector reaches 50%), and with it the likelihood of a reduction in the minimum wage having a positive impact on the terms of trade. When the relevant parameters are such that the demand for Q falls by more than its supply, a reduction in P (informal sector's terms of trade) should be expected.

Proposition 1: When the productivity of informal sector workers does not change with the employment level ($\sigma=0$), a necessary and sufficient condition for a reduction in the minimum wage increasing the real informal wage through an improvement in its terms of trade vis-a-vis the formal sector is:

$$\text{if } \sigma=0 \rightarrow \gamma < 0 \rightarrow \eta > e_{yr} \frac{L_f}{L} \quad (21)$$

Equation (21), derived from (20), is thus the necessary and sufficient condition for PTTE being negative, so that a reduction in the minimum wage improves the informal sector's terms of trade. This result has the interesting implication that a reduction in the minimum wage is most likely to reduce informal sector earnings the larger the employment share of the informal sector.

The second term on the right-hand side of (20), the productivity effect, reflects the impact (on the real informal wage) of the change in labor productivity resulting from the inter-sectoral reallocation of labor that follows a reduction in the minimum wage. Given the assumption of diminishing labor productivity ($\sigma < 0$), the real informal wage increases as a result of a reduction in the minimum wage.²⁸

The third term on the right-hand side of (20) represents the change in terms of trade that results from the change in labor productivity. Thus I will call it the productivity-induced terms of trade effect. A reduction in the minimum wage increases informal labor productivity and the per capita supply of Q. Whether the per capita surplus increases depends on the income elasticity of the demand for Q by informal sector workers. If this elasticity is sufficiently high the terms of trade will improve as a result of the reduction in the minimum wage.

Proposition 2: The necessary and sufficient condition for a change in labor productivity (resulting from a reduction in

²⁸ In the case in which average productivity of informal sector workers falls as the most able workers move into the formal sector, the sign of the productivity effect is reversed. However, individual informal workers will experience a reduction in their wages only if there exists some type of externality associated with the use of skills. In other words, if the fruits of labor were appropriated individually in their entirety, we shouldn't expect any productivity effects at the individual level.

the minimum wage) improving the informal sector terms of trade is:

$$e_{YI} > \frac{q}{q_i} \quad (22)$$

An important implication of (22) is that, given the stability condition, it is necessary that the demand for Q be price-elastic for the productivity-induced terms of trade effect to be negative.

Equation (20) can be further simplified if the productivity and productivity-induced terms of trade effect are merged into what can be called the net productivity effect (NPE), as in (23).

$$\gamma = \left[\frac{(q - q_i)(1 - \alpha)(\eta L - e_{YI} L_i)}{L_I (e_{YI} q_i - e_P q)} + \frac{[q(1 - e_P) - \alpha(q - q_i e_{YI})] \sigma \eta}{(e_{YI} q_i - e_P q)} \right] \frac{L_I}{L_i} \quad (23)$$

As the productivity effect is unambiguously negative, condition (22) is sufficient for the NPE being negative. However, less stringent conditions can be derived.

Proposition 3: It is sufficient that the demand for Q be elastic for the NPE to be negative (so that a reduction in the minimum wage has a positive effect on real informal

wages).²⁹ When this condition is not met, a lower bound on α (Q's weight in π) is necessary and sufficient for a negative NPE:

$$\begin{aligned} & \text{if } \sigma < 0, \quad NPE < 0 \iff e_p \geq 1 \\ & \text{if } \sigma < 0 \text{ and } e_p < 1, \quad NPE < 0 \iff \alpha > \frac{1 - e_p}{1 - \frac{q_i}{q} e_{v_i}} \end{aligned} \quad (24)$$

The interpretation of proposition 3 is straightforward. Given $\sigma < 0$, the per capita supply for Q increases as the minimum wage is reduced. If Q's demand were elastic, per capita revenue (and the real wage) would unambiguously increase. However, even if the demand for Q were inelastic and per capita revenue falls as a result of the reduction in the minimum wage, the real consumption wage would still increase due to the reduction in the price, if Q's share in the consumption basket were sufficiently large.³⁰

The final effect on the real informal wage of a reduction in the minimum wage will depend on both the PTTE and the NPE. Table 2 synthesizes the different possible

²⁹It must be remembered that the stability condition implies that $e_p \geq 1$ is less stringent than condition (22).

³⁰When there is increasing productivity ($\sigma > 0$), it is necessary that the demand for Q be inelastic for the NPE to be negative. This necessary condition being satisfied, an upper bound on α is necessary and sufficient for the NPE to be negative. As $\sigma > 0$, the per capita supply of Q falls as the minimum wage is reduced, and thus an inelastic demand is required for per capita revenue to increase. The upper bound on α guarantees that the improvement in terms of trade will not result in a reduction in the real consumption wage of informal workers.

outcomes. The conditions for each entry have been determined above.

Table 3:

	NPE > 0	NPE < 0	NPE = 0
PTTE > 0	$\gamma > 0$?	$\gamma > 0$
PTTE < 0	?	$\gamma < 0$	$\gamma < 0$
PTTE = 0	$\gamma > 0$	$\gamma < 0$	$\gamma = 0$

As table 3 suggests, when the PTTE and NPE have opposite signs, a qualitative answer cannot be given: the impact of a reduction in the minimum wage will depend on how strong the two effects are.

The principal message of the model is that including demand links between the two sectors generates much more complex results than those suggested by standard models focusing exclusively on labor supply links between sectors. The model identifies the conditions for the standard result to hold, with the implication that the possibility of a non-standard result cannot be ruled out, even if the allocation effects of a reduction in the minimum wage are in the direction of reducing informal employment.

Available evidence indicates that the non-standard result is not just a curiosity, but a real possibility among many countries in Latin America. According to recent estimates by the International Labour Organization almost one

third of the urban population in the area is employed in the informal sector.³¹ Accurate estimates of the wage-employment elasticity in the formal sector of the economy are not easy to obtain. The most recent evidence appears to indicate values in the range between 0.2 and 0.5 (Bourguignon [1988] and Solimano [1987]).³²

Based on these parameters, the PTTE would be positive (a reduction in the minimum wage worsens the informal sector's terms of trade) for values of the income-elasticity of the demand for the informal sector good (ϵ_{yf}) ranging between 0.65 and 1.63. Lustig [1979] has used Mexican data to estimate income-elasticities for traditional manufacturing goods (clothing, furniture, etc.) and services by low income families that range between 1.06 and 2.19. Tokman [1978] suggests that the income-elasticity for goods produced in the informal sector in Chile and Mexico is close to 2.0. Lluch et al [1977], have estimated income-elasticities of demand by low income households in a number of Latin American cities. The elasticities corresponding to clothing (the other items

³¹According to PREALC [1987] 30.7% of the urban population, in a sample of nine Latin American countries, worked in the informal sector in 1985.

³²Solimano [1987] estimates the wage-employment elasticities for the manufacturing sector in Brazil and Chile under three macroeconomic regimes: Keynesian, Foreign Exchange Constraint, and Classical. The estimates corresponding to the first two regimes are either positive or close to zero. Under the classical regime the elasticity takes values within the above mentioned range.

being food, housing, and durable goods) range between 1.16 and 1.83.

The available empirical evidence, thus, appears to indicate that the PTTE might actually be positive in many Latin American countries. This result is more likely to take place in those countries in which the employment share of the informal sector is above 30%.

It is somewhat harder to empirically establish the direction of the NPE. The evidence amassed by Lluch et al [1977] indicates that the demand by low income households is price inelastic. In the case of the demand for clothing, most of the estimates range between -0.2 and -0.4. Such low values imply that a negative NPE would require that informal workers spend an extremely large percentage of their income on goods produced in the informal sector.

Testing the likelihood of a non-standard result on the exclusive basis of the labor mobility effect (as suggested by Mincer) could be misleading if the parameters are such that either the PTTE or the NPE are positive. A more complete test of the model requires better information on the nature of the goods produced in the informal sector, as well as the consumption patterns of low-income families both in the formal and informal sectors. The simple calculations discussed above suggests that such an enterprise could be extremely productive.

4. CONCLUSIONS

The model developed in this essay suggests that the answer to the title question "Do workers in the informal sector benefit from reductions in the minimum wage?" is "it depends". If workers in the formal sector are the main buyers of the goods produced in the informal sector, and their income elasticity of demand is relatively large, the answer could be negative. Also, a non-standard result is more likely if the informal sector employs a large share of the urban labor force, and the demand for the goods produced in the informal sector is price-inelastic. More generally, the presence of demand links between the two sectors does not allow one to make strong a priori predictions.³³

What distinguishes this model from Mincer's treatment of the same problem is that the direction of the effect of changes in the minimum wage on informal sector earnings does not depend exclusively on that of the labor mobility effect. The possibility of a non-standard result cannot be ruled out, even if the allocation effects of a reduction in the minimum wage are in the direction of reducing informal employment. This aspect of the model is important for two reasons. First, it provides a more general explanation, including a wider set

³³Bourguignon [1990] reached a similar conclusion when analyzing the role of demand factors influencing the relationship between growth and inequality.

of conditions under which a non-standard result can occur. Second, the result is not dependent on the existence of high levels or large changes in open unemployment.

The model highlights two sources of change in informal sector earnings: changes in the inter-sectoral terms of trade, and changes in informal-labor productivity. With respect to the second source, the existence of diminishing labor productivity has been assumed. When the existence of heterogenous labor is considered, a case with increasing labor productivity may arise, which makes it even more difficult to make a priori predictions about whether informal sector workers benefit from reductions in the minimum wage.

In section 1 of this essay two views of minimum wages - those derived from the standard approach and those suggesting that earnings of informal workers are positively affected by minimum wages - were contrasted. Using a model in which the two sectors are linked both through the labor and goods markets, this paper shows that those views can be treated as two potential outcomes arising from a more general case.

The empirical evidence, which apparently indicates a higher likelihood of a non-standard result, seems to be supportive of the case against reductions in the minimum wage. In that sense, the main policy implication of this paper is that governments, and multilateral organizations, should be cautious when following the advice of standard

theories, which suggest that reductions in the minimum wage will benefit workers in the informal sector.

It should be noticed, however, that a non-standard result does not affect the case against minimum wages on efficiency grounds. In the context of the model here discussed, a reduction in the minimum wage increases employment and output in the formal sector of the economy. Such conclusion could be changed in a more general approach which includes wage-productivity links, as suggested by efficiency wage theories.

The model presented in this essay is symmetric in nature. Thus, as long as the conditions for a non-standard result are satisfied, it follows that workers in the informal sector should benefit from policies that increase minimum wages. The experience of several Latin American countries, however, indicates that aggressive minimum wage policies have not been particularly successful in improving standards of living in the informal sector. Such an asymmetry could result from the existence of nominal rigidities which the model presented in this essay, built in real terms, is not able to capture.

APPENDIX

In Mincer's model workers search for jobs in the formal sector until the net expected discounted gain of such search equals zero.

$$\sum_0^{\infty} \frac{W_f P_t - W_i}{(1+r)^{t+1}} = 0$$

where W_f and W_i are the wages in the formal and informal sector respectively, r is the discount rate, and p_t is the probability of being employed in period t , which equals:

$$P_t = \sum_0^t p [(1-p)(1-\delta)]^j$$

where δ is the rate of labor turnover in the formal sector.

The probability of finding a formal sector job during a particular period (p) is defined as:

$$p = \frac{\delta}{\delta + u}$$

where u is the unemployment rate. When the time period is sufficiently small, the equilibrium unemployment rate equals:

$$u = \frac{\delta}{(r+\delta)} \left(\frac{W_f}{W_i} - 1 \right) = \alpha \left(\frac{W_f}{W_i} - 1 \right)$$

Then, the following expression can be derived:

$$\frac{dW_i}{W_i} = \frac{\alpha - \eta}{\delta + \frac{L_i}{L_f} e} \frac{dW_f}{W_f}$$

where η and e are the elasticities of labor demand in the formal and informal sector, and L_i and L_f employment in the two sectors. The elimination in the minimum wage will reduce the informal sector wage only when $\eta < \alpha$.

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