Minimum Wage, Inflation and Unemployment;
A Simultaneous Equations Analysis

by
Allechi M'Bet

A Dissertation Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy
in Economics

at
The University of Wisconsin-Milwaukee (USA)

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Abstract

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The University of Wisconsin-Milwaukee, 1984
Under the Supervision of Professor Richard Perlman

More than forty years after its establishment, the minimum wage (henceforth MW) legislation still remains controversial. Previous research has addressed this controversy by examining various employment/unemployment effects of the MW increases over time. Recent studies have reached opposing conclusions concerning the employment effect of the MW. On the one hand, the MW is reported to have a substantial impact on employment, especially on teenagers. On the other hand, it is shown that the MW effect washes out when the changing composition of the labor force is taken into account. The collective evidence from this research provides a broad accounting of the different effects of the MW on different groups.
unemployment stems in large measure from the tremendous increase in the female labor supply. The MW shows an ambiguous impact on youth employment and wage inflation has no notable effect.

These more accurate estimates will lead to policy recommendations that are more adequate.
Acknowledgements

I would like to express my gratitude and appreciation to all the members of my doctoral committee for their constant support and availability in the successful completion of this dissertation.

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*Centre Ivoirien de Recherche Economique et Sociale (Center for Economic and Social Research - Ivory Coast).
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Introduction and Statement of the Research

Numerous studies have emerged over the past decade dealing with the effects of the minimum wage legislation on employment (Mincer, 1976; Gramlich, 1976), with special emphasis on employment of teenagers. These studies uniformly show that some amount of disemployment results from the imposition of an effective minimum wage.

Nevertheless, there is considerable dispute concerning both the identification of affected groups as well as the magnitude of these effects. For example, Marvin Kosters and Finis Welch conclude that increases in the minimum wage would help blacks out of poverty.

Milton Friedman to the contrary believes that the minimum wage does blacks the most harm out of any group. Yale Brozen argues that minimum wage increases would lead to teenage job loss.

The main objective of this research is to provide new empirical evidence on the minimum wage effect by extending and amending previous studies so as to account for the additionally relevant effects of wage-inflation and the continuous increase in the female labor force. A system of simultaneous equations is employed in contrast to most previous single-equation studies that utilized either time-series or cross-sectional data.

Chapter I presents a literature review of the minimum wage effect on employment/unemployment. Chapter II describes a model of three
simultaneous equations to be used as an alternative specification to estimate the minimum wage effect. Chapter III contains a discussion of the data and the empirical findings. Policy implications of the study are analyzed in Chapter IV.
CHAPTER I

LITERATURE REVIEW OF MINIMUM WAGE EFFECTS ON EMPLOYMENT/UNEMPLOYMENT

The MW literature does not offer consistent or reliable conclusions. While several studies of the employment/unemployment effects of the MW have been conducted, especially the effects of the MW on teenage labor force status, no settled results are available.

Part of the problem appears to be methodological. Nearly all previous studies used single-equation models and found a negative employment impact of the MW. Although the research is consistent in finding some employment reduction associated with the MW increases, the estimated effects on unemployment are more varied. Of interest are studies by Kaitz (1970), Moore (1971), Adie (1971), Lovel (1972), Mattila (1979), and Charles Brown, Gilroy and Kohen (1981). However, a distinction must be made between time-series studies and cross-section ones, as well as between early studies and more recent ones.

Time-series studies rely on differences over a period of time to estimate the MW effect; i.e., how does youth employment change when the MW changes. Most time-series research estimates the effect of the MW only for youth. This group is often disaggregated by age (16-17; 18-19 and 20-24 years), sex and race. Peter Mattila (1978 and 1979)
and Ragan (1977, 1979) further disaggregate by school enrollment status; Gramlich (1976) breaks down the total teenage population by full-time and part-time status while Welch (1976) considers the distribution of teenage employment by major industry. (A more complete inventory of time-series studies is presented in Table 1).

**Cross-section studies:** An alternative approach to the time-series method is to rely on cross-sectional data in order to make comparisons between states or metropolitan areas that differ in the importance of the MW. Table 1 contains the major cross-sectional studies. The crucial question confronting the cross-sectional approach is to know how to identify differences in the degree of importance of the MW when a single federal MW law applies to all states. Statistically, indeed, if the MW remains constant across states, one cannot estimate the MW effect.

Two methods to overcome this problem have appeared in the literature. The first method is the standard direct approach; it examines the link between teenage employment and a MW variable (Ragan, 1977).

Second, we have the indirect approach originated by Ragan (op cit.). It consists of a two-step technique: step 1 tests whether MW raises youth wage rate in absolute terms and relative to other wages. In step 2 the relationship between youth wages and youth employment is tested.

This indirect procedure provides another test whether an increase in the MW reduces youth employment within a cross-sectional setting.
Arnold Katz and Alan Fisher use such an approach to analyze the relationship between youth wages and youth employment. The major drawback of cross-sectional setting is that it does not enable us to study the impact of changes in the Federal MW.

Another distinction is made in the literature on the MW effect between early studies and more recent studies. On the one hand, most early studies use 1960 census data and ask whether state minimum wage laws lowered teenage employment.

Unemployment equations were a characteristic of those early studies. They assumed that teenage employment/unemployment was only affected by the current value of the MW, although some allowed for lagged response. Katz (1970) used data from the period 1954-1968, while Moore (1971) covered the period 1954-1958.

The more recent studies, on the other hand, have estimated the MW effect on the employment/population ratio and labor force participation rate, and have derived the unemployment effect from these (Mincer, 1976; Welch, 1976; Brown et al., 1981). But due to the extension of the Federal MW coverage in the 1960's, the importance of state laws has been reduced; and later research analyzed mainly the impact of the Federal MW on the labor force status.

These recent studies find a loss in employment which is often offset by the decline in labor force participation so that only part of the reduction in employment is attributable to an increase in unemployment.
Table 1 presents a summary of the findings of selected empirical studies on the impact of the MW; for both time series and cross-sectional data; and early studies and recent research as well.
<table>
<thead>
<tr>
<th>Author/Date of Publication</th>
<th>Period Covered by Study</th>
<th>Dependent Variable</th>
<th>Effect of an Increase in the Minimum Wage and/or Coverage on Dependent Variable</th>
<th>Coverage Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaizt (1970)</td>
<td>1954-68</td>
<td>Aggregate Teenage Employment and Unemployment</td>
<td>Inconclusive</td>
<td>Yes</td>
</tr>
<tr>
<td>Moore (1971)</td>
<td>1958-69</td>
<td>Aggregate Teenage Unemployment</td>
<td>Increases Teenage Unemployment</td>
<td>Yes</td>
</tr>
<tr>
<td>Adie (1971)</td>
<td>1954-70</td>
<td>Aggregate Teenage Unemployment</td>
<td>Increases Teenage Unemployment</td>
<td>Yes</td>
</tr>
<tr>
<td>Lovel (1972)</td>
<td>1954-70</td>
<td>Aggregate Teenage Unemployment</td>
<td>Inconclusive/No Change</td>
<td>No</td>
</tr>
<tr>
<td>Welch (1974)</td>
<td>1954-68</td>
<td>Teenage Employment in Manufacturing, Retail Trade and Service Sector</td>
<td>Decrease Teenage Employment</td>
<td>Yes</td>
</tr>
<tr>
<td>Gramlich (1976)</td>
<td>1954-68</td>
<td>Aggregate Employment/population and Aggregate Labor Force/Population for 10 age/sex/race groups</td>
<td>Decrease Labor Force and Employment for most groups</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**CROSS-SECTIONAL STUDIES**

<table>
<thead>
<tr>
<th>Author/Date of Publication</th>
<th>Period Covered by Study</th>
<th>Dependent Variable</th>
<th>Effect of an Increase in the Minimum Wage and/or Coverage on Dependent Variable</th>
<th>Coverage Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welch and Cunningham (1976)</td>
<td>1970 State</td>
<td>Aggregate Employment/Population by age groups</td>
<td>Decrease Teenage Employment</td>
<td>Yes</td>
</tr>
<tr>
<td>Ehrenberg/ Marcus (1979)</td>
<td>1970 State</td>
<td>Youth Employment/Population ratio by enrollment Status</td>
<td>Increase White Youth employment. Not reported for non-white youths</td>
<td>Yes</td>
</tr>
<tr>
<td>Freeman (1979)</td>
<td>1970 SMSA</td>
<td>Employment/Population ratio and Labor Force Participation and unemployment rate</td>
<td>Decrease Labor Force Participation and employment increase unemployment</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Theoretical Framework:

Academic discussions of the MW start with the implications of standard economic theory for the effect of the MW on employment. The objective is to explain and to test the predictions of the theory. Historically, the purpose of the Fair Labor Standards Act (FLSA) of 1938 is to raise wages "without substantially curtailing employment."7

According to theory, the underpinnings of MW research lie in the traditional Marshallian setting. This conventional supply and demand model depicts the equilibrium wage and employment levels at Wo and Eo respectively as in Figure 1. With the imposition of a mandatory MW (Wm), the theory predicts a decrease in employment from OEO to OE1 and a labor surplus of E1-E2, as a result of a fall in the labor demand and a rise in the quantity of labor supply at the new wage (Wm).
Figure 1: Graphical representation of an effective MW effect.
At the above-equilibrium wage (Wm), employers hire few workers or hire the same number of workers fewer hours per week. However, the theory does not specify the magnitude of the reduction in employment or the work week. Still at Wm, fewer jobs (E1) are available for more workers (E2) and not all willing, ready and able to work at the MW will find jobs.

The model holds the gap E1-E2 as a measure of maximum unemployment and the ratio (E1-E2)/(0-E2) as the unemployment rate. Obviously not all of the E1-E2 workers will be counted officially as unemployed; but the amount of past research focusing on the unemployment effects of the MW is a testimony to the popularity of this interpretation.

Two major criticisms of the basic theory of the competitive labor market appear in the literature.

First, in labor markets characterized by monopsony, a skillfully set MW may actually increase employment. The monopsony model has not motivated recent work, perhaps because there is little evidence that it is important in modern-day low-wage labor markets.

A second line of criticism concerns the "shock" argument. The "shock" argument is the one in which the employer is able to obtain greater levels of effort in response to the MW increase. Brown et al. note that if employers do not minimize costs, there is a possibility that they will respond to the MW increase by raising the productivity of their operation, to offset the MW increase. This offsetting operation labelled "shock" effect, might reduce the disemployment from the MW, not eliminate it.
It is difficult to test the validity of the monopsony model and to measure the "shock" effect. As a consequence, the empirical work has relied on the basic supply-demand model. The theory, however, has been refined in four ways.

First as an extension of the basic model, both the covered and uncovered sectors were introduced (Welch, 1974; Gramlich, 1976; Mincer, 1976). In fact, the FLSA even with its most recent amendments in 1977, is not universal but includes certain industries engaged in intrastate commerce and all industries engaged in interstate commerce. About 84% of all private nonfarm, nonsupervisory wage and low-wage workers have been subject to the MW in 1978 compared with 53% in 1950 (Welch, op cit., p. 3). It is therefore important to consider a model in which coverage is complete and another where it is incomplete. Table 2 puts forth the evolution of and the coverage by the minimum wage.

Theory suggests that the imposition of the MW reduces employment in the covered sector. Workers unable to find jobs in the covered sector will either (1) work in the uncovered sector; (2) withdraw from the labor force; or (3) remain unemployed with the expectation of getting a job in the covered sector. Consequently, a flow of workers will occur between the two sectors and this will eventually shift the supply curve in the uncovered sector if alternative (1) is chosen (i.e., the unemployed workers choose to work in the uncovered sector). A downward pressure will be put on the wage in that sector.
### Table 2: Minimum Wage Legislation in the United States, 1938-1980.

<table>
<thead>
<tr>
<th>Effective Date of Minimum Wage Change</th>
<th>Nominal Minimum Wage</th>
<th>Percent of Nonsupervisory Employees Covered</th>
<th>Minimum Wage Relative to Average Hourly Wage in Manufacturing Before</th>
<th>Minimum Wage Relative to Average Hourly Wage in Manufacturing After</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/24/38</td>
<td>$0.25</td>
<td>43.4</td>
<td>-</td>
<td>0.403</td>
</tr>
<tr>
<td>10/24/39</td>
<td>0.30</td>
<td>47.1</td>
<td>0.398</td>
<td>0.478</td>
</tr>
<tr>
<td>10/24/45</td>
<td>0.40</td>
<td>55.4</td>
<td>0.295</td>
<td>0.394</td>
</tr>
<tr>
<td>1/25/50</td>
<td>0.75</td>
<td>53.4</td>
<td>0.278</td>
<td>0.521</td>
</tr>
<tr>
<td>3/1/56</td>
<td>1.00</td>
<td>53.1</td>
<td>0.385</td>
<td>0.512</td>
</tr>
<tr>
<td>9/3/61</td>
<td>1.15</td>
<td>62.1</td>
<td>0.431</td>
<td>0.495</td>
</tr>
<tr>
<td>9/3/63</td>
<td>1.25</td>
<td>62.1</td>
<td>0.467</td>
<td>0.508</td>
</tr>
<tr>
<td>9/3/64</td>
<td>1.25</td>
<td>62.6</td>
<td>0.441</td>
<td>0.494</td>
</tr>
<tr>
<td>2/1/67</td>
<td>1.40</td>
<td>75.3</td>
<td>0.465</td>
<td>0.531</td>
</tr>
<tr>
<td>2/1/68</td>
<td>1.60</td>
<td>72.6</td>
<td>0.465</td>
<td>0.531</td>
</tr>
<tr>
<td>2/1/69</td>
<td>1.60</td>
<td>78.2</td>
<td>0.465</td>
<td>0.531</td>
</tr>
<tr>
<td>2/1/70</td>
<td>1.60</td>
<td>78.5</td>
<td>0.465</td>
<td>0.531</td>
</tr>
<tr>
<td>2/1/71</td>
<td>1.60</td>
<td>78.4</td>
<td>0.465</td>
<td>0.531</td>
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<tr>
<td>5/1/74</td>
<td>2.00</td>
<td>83.7</td>
<td>0.363</td>
<td>0.454</td>
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<tr>
<td>1/1/75</td>
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<td>83.3</td>
<td>0.423</td>
<td>0.445</td>
</tr>
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<td>1/1/76</td>
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<td>83.3</td>
<td>0.423</td>
<td>0.445</td>
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<tr>
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<td>2.65</td>
<td>83.3</td>
<td>0.423</td>
<td>0.445</td>
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<tr>
<td>1/1/79</td>
<td>2.90</td>
<td>83.3</td>
<td>0.423</td>
<td>0.445</td>
</tr>
<tr>
<td>1/1/80</td>
<td>3.10</td>
<td>83.3</td>
<td>0.423</td>
<td>0.445</td>
</tr>
<tr>
<td>1/1/81</td>
<td>3.35</td>
<td>83.3</td>
<td>0.423</td>
<td>0.445</td>
</tr>
</tbody>
</table>

Source: Ehrenberg/Smith (p. 69).
But as Hughes and Perlman (1984) observed, if wages in the uncovered sector are not assumed to be falling freely because of what Reder (1955) called a "social minimum," then it can be the case where wage rate rises in both sectors.

Figure 2 presents a graphical analysis of the unemployment effects of minimum wage in a two-sector model.

Before a MW is imposed, wages are equal in both sectors. An effective MW raises the wage level in the covered sector to $w^c_1$. We assume new entrants into the labor force and flexible adjustments of workers in both sectors. As a result of the higher MW, an unemployment gap of $AC$ is created in (c); $AB$ represents the displaced workers in (c) and $BC$ the transfer of workers from the uncovered market, attracted by the new higher minimum wage.

Thus to the work force $E^U_0$ formerly in the uncovered sector, are added the displaced workers $E^c_0 - E^c_1$. But because the demand curve for labor slopes down in the uncovered sector also, the increased supply of potential workers drives down the wage from $W^u_0$ to $W^u$.

In the covered sector, workers are selected positively on the basis of their marginal productivity; in the uncovered sector however, getting a job will be negatively related to skill. Such partial coverage of the minimum wage produces winners and losers. The winners are those workers in the covered sector who keep their job ex post; the losers are those low-skilled workers who lose their jobs in the covered sector and now are paid a lower wage in the uncovered sector. Hence on balance, there is no impact on unemployment. But there are redistributio nal effects in the process.
Figure 2: Effects of a Minimum Wage on Covered and Uncovered Sectors.
The second refinement of the basic model is to redefine who are the unemployed E1-E2 in Figure 1 by separating "discouraged workers" from the unemployed. Discouraged workers want a job but have given up searching and are classified "out of the labor force" and excluded from the official unemployment count. This explains the reason why the basic model cannot predict unambiguously the effects of the MW on unemployment.

The third refinement is in connection with the recent shift to the use of employment as dependent variable instead of focusing on unemployment as did many previous empirical studies.

Brown et al. (1981) argue that the employment loss is a better measure of the "harm" done by a rise in the MW than is the change in unemployment. They note that because of the "discouraged" workers, the harm measured by the change in unemployment is understated.

Mincer (1976) finds the discouragement effect to be stronger for many demographic groups with a reduction in the labor force participation of the affected workers. Mincer's findings suggest that the unemployment increase is less than the employment decline.

Welch (1974) supports the study of the more definite employment effect: "because of the ambiguity of the standard model concerning the effect of MW on unemployment, it is surprising that the majority of empirical analyses of MW effects have focused on unemployment rather than on employment, where predictions are unambiguous, at least for competitive labor markets."
Several reasons explain the persistent use of unemployment as dependent variable. First, there is a natural tendency for policy purposes to want to focus directly on what is seen as the problem: unemployment with all its social and political ramifications. The second reason is the reluctance to part with the attractive simplicity of the basic supply-and-demand model. But analysts have since come to realize that incentives to withdraw from the labor force have been increased by the availability of second-level opportunities such as school enrollment, welfare, non-market work, and armed forces.

Furthermore, focusing on employment status allows the distinction between full-time and part-time employment. In addition, the changes in the method of measuring the labor force status introduced to the Current Population Survey (CPS) in 1967 affected the count of unemployed significantly more than the employed (Stein, 1967; Summers, 1981). Summers describes some of the movements in the unemployment rate as spurious "because of the uncertainties surrounding the statistical procedures used in measuring unemployment." Response errors, sampling errors and seasonal adjustment errors create biases in the unemployment rate. Moreover, inconsistencies of people interviewed across rotation groups, undercoverage, nonresponse and even noninterviews create great standard errors associated with unemployment and employment rates. The standard errors in the unemployment rates are greater reflecting the smaller sample size; the errors in employment-population ratio are smaller because this ratio is a much larger number. Summers then suggests the changes in
employment as alternative labor market indicators. He concludes:

"Changes in employment, measured by the establishment survey, may provide a better guide to changes in labor market conditions than changes in unemployment because of ambiguities in the definition of the labor force."

A final refinement of the basic model can be considered under a dynamic setting as it appears in Figure 3. When the overall trend in output is upward, the theory suggests that rather than necessarily reducing employment, the MW would retard the rate of employment growth. As in Figure 3, the initial equilibrium is at Wo and Eo for wage and employment respectively. But as the demand for labor is increasing as economic activity expands, a minimum wage Wm is imposed. At Wm the new equilibrium level of employment is settled at E2 instead of at E1 where E0 < E2 < E1. In such a case, the MW need not reduce employment in an absolute sense, but it would reduce the rate of growth in the employment from what it would have been in the absence of the MW. However, the loss of potential employment is counted as employment loss due to the MW.

A formal demonstration of the ambiguous effect of the MW on the labor force status is provided in the next pages.

Heterogeneity in the labor market: The special case of teenage labor.

Homogeneity in the labor force was the underlying assumption of the theoretical analysis of the effect of the MW presented earlier. In fact, there exists a great deal of disparity among workers due to
Figure 3: The Disemployment Effect of the MW in a Dynamic Setting.
characteristics such as age, sex, race, human capital, etc. Indeed teenagers have in recent years experienced great difficulties getting jobs, a fact some economists attribute to the Federal minimum wage legislation.

The overall assessment so far, based on theory and past studies, reveals that the MW reduces employment and, in so doing, generate some redistributional effects.

Concern has especially focused on teenagers who lack work experience and skills. Some adults are also denied jobs as a result of the minimum wage; but overall teenagers bear a disproportionate share of the burden.

The table below provides some supportive information which compares data for two years, 1955 (well before important changes in the MW took place) and 1978.

For 1955 Osterman found that the unemployment rate of 35-44 year old White males was 2.6 percent. In 1978, it stood at 2.5 percent.

The two periods are quite comparable. Likewise White teenagers have held up quite well with a small rise in the employment to population ratio.

The major development during the same period of time is the virtual collapse of the labor market for Black teenagers. Congress and successive administrations have shown some willingness to retain the minimum wage protection for most adult workers. However, because of the overriding teenage unemployment rate (more than double the rate of adults), some analysts have suggested a "dual" or "subminimum" or a "two-tiered system," with a lower minimum wage for teenagers than for adults.
### Table 3: Employment status of White and Black youth, 1955 and 1978.

<table>
<thead>
<tr>
<th>Population Subgroups</th>
<th>Unemployment rate</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16-19 year old Whites</td>
<td>10.3%</td>
<td>13.9%</td>
<td>10.3%</td>
</tr>
<tr>
<td>16-19 year old Blacks</td>
<td>15.8%</td>
<td>36.3%</td>
<td>15.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Population Subgroups</th>
<th>Employment to population ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-19 year old White male</td>
<td>.52</td>
</tr>
<tr>
<td>16-19 year old White female</td>
<td>.37</td>
</tr>
<tr>
<td>16-19 year old Black male</td>
<td>.52</td>
</tr>
<tr>
<td>16-19 year old Black female</td>
<td>.26</td>
</tr>
</tbody>
</table>

But such special treatment for youth has been opposed by labor unions, on the ground that employers might lay off adults with families to support, in order to hire teens at a lower differential wage.

Furthermore, why not grant other subgroups with problems special treatment to encourage their employment? Is such treatment justified in any dimension—human and otherwise (economic)? Politics is known as the art of the possible; hence it is only natural to concentrate one's effort on a segment of the labor force where change is considered probable. Thus, for the first time, the high teenage unemployment led to an amendment of the Federal Minimum Wage Act of 1977. It was proposed to set a sub-minimum rate for youths in Congress. The amendment was defeated by a single vote; this demonstrates the offsetting strength of the argument for and against a lower subminimum for teenagers. Like the Nixon Administration which favored a subminimum wage for teenage workers, the Reagan Administration recently proposed "the 1984 Youth Opportunity Wage Act" which was introduced in the U.S. House and Senate on May 17, 1984. Congress has debated the issue time and again since 1980 but taken no action on the bill. The bill would amend the Fair Labor Standards Act to permit employers to pay youth an hourly wage of $2.50—i.e. 85 cents below the legal minimum.

Econometric studies that show a good deal of harm caused to younger workers by the MW bolster the case for a subminimum wage. However, as with most controversial issues, economists can not agree
about the true magnitude of the changes brought by the MW. An examination of selected investigation in Table 1 demonstrates how divergent are the estimates reached by different analysts.

Because of such controversy over the magnitude of the estimates, and like most previous studies, this dissertation deals with teenage labor force status as the dependent variable; and we intend to test the robustness of the degree of the negative impact of the MW on teenage labor force status, using a new approach.

Preceding such an approach is the presentation of a theoretical model of employment.
CHAPTER II
MODEL AND METHODOLOGY

A Probabilistic Choice-Theoretical Model of Employment

The purpose of anticipating the MW effects on a priori grounds is to permit a more intelligent evaluation and interpretation of empirical findings. But to understand this evaluation fully, certain theoretical aspects should be made to provide a framework within which to adequately interpret empirical results. A full theoretical treatment is beyond the scope of this study, however. Instead, a brief but quite substantial theoretical model is presented that should explain the ambiguity in empirical results.

The Theoretical Ambiguity of the MW: A Two-Sectors Model

A common theme of economic literature is that the MW decreases employment, with only the empirical magnitude in doubt.

Actually, the theoretical link between the MW and Employment is not at all straightforward as it appears. On the contrary, only one sector model, i.e., model with complete coverage, finds such unambiguous negative employment effect of the MW.

The models of Welch (1974) and Mincer (1976), although more sophisticated are still incomplete. They do recognize the existence of the uncovered sector but fail to consider the general-equilibrium repercussions of a change in the MW.
Hence, instead of using partial-equilibrium analysis, or ignoring the uncovered sector, we present a more elaborate model in a general-equilibrium framework along with the uncovered sector.\(^9\)

**Assumptions of the Model**

a) Consider the labor market impact of the MW within a two-sector competitive model, i.e., a partitioned market into the uncovered (u) and the covered (c) sectors.

b) Labor is homogeneous.

c) Wages in the covered sector are equal to the MW or the market wage.

d) Wages in the uncovered sector are determined by supply and demand.

e) The MW is effective; that is, it is set above the market wage.

Under the above assumptions, we show that in a general-equilibrium setting, there exists some ambiguity in the impact of the MW on employment. Indeed, conditions exist under which an increase in the MW will increase total employment. To demonstrate that point, consider an individual deciding to enter the labor market. The individual's decision to enter the labor force depends on the "expected" utility of market activity relative to the expected utility of non-market activity: leisure and work outside of the labor market. The individual maximizes expected utility (instead of utility) in order to express the fact that the individual's choices are made under uncertainty. The expected utility of getting a job in a given sector is determined by the PROBABILITY of obtaining a job in that sector and by the expected wage, conditional on job
availability. Assumption d) states that the uncovered sector clears; thus in a perfectly competitive world, the probability of finding a job there is unity. In the covered sector, however, the probability of finding a job is inversely related to the excess labor supply.

The expected utility of market activity can be expressed as:

\[ E(U) = \max \quad E(U^C) = f(MW, PB) \]

\[ E(U^U) = f(W_u, 1) \quad f_i > 0 \text{ for } i=PB \]

where \( U^C \) = utility from entering the covered sector;
\( U^U \) = utility from entering the uncovered sector;
\( MW \) = minimum wage measure
\( PB \) = the probability of finding a job in the covered sector
\( W_u \) = wage rate in the uncovered sector.

The Supply Function of Labor

Based on (1), ceteris paribus, an increase in the MW, PB, or \( W_u \) will attract more people into the labor force. The degree of attractiveness will be higher the higher the value for \( MW \) and \( PB \) of entering the covered sector. The supply of labor in the covered and uncovered sectors both depend on function of \( W_u \), \( MW \), and \( PB \); and they can be expressed respectively as:

\[ L^C = L^C(W_u, MW, PB) \quad (2) \]

\[ L^U = L^U(W_u, MW, PB) \quad (3) \]

The Demand Function for Labor

The labor demand in a sector is negatively related to the wage prevailing in that sector, featuring the downward-sloping demand curve

\[ (2) \text{ and (3) are the labor supply functions; they may be affected by other factors. Since we focus on the impact of the MW, ceteris paribus, we ignore at this theoretical level the values of all other exogeneous variables for the sake of clarity.} \]
for labor; it is also a function of product price \( (p) \) which in turn depends on the wage rates in the two sectors. The MW increases the costs of labor in the covered sector, thereby raising the price of the product produced there relative to the price of product in the uncovered sector. Consumers, assumed to be rational and well-informed, substitute goods produced in the uncovered sector for those produced in the covered sector. Labor demand in the uncovered sector expands and labor demand in the covered sector contracts. This is precisely the spillover effect ignored in partial-equilibrium analysis as in Mincer (1976). The direction of such a spillover effect is not known a priori, leading to the ambiguity of the MW effects.

After full adjustment, the labor demand can be expressed as:

\[
D^C = D^C(MW, P) \quad (4)
\]
\[
D^U = D^U(W_u, P) \quad (5)
\]

\( P \) is the price of goods produced in the covered sector relative to the price in the uncovered sector; \( p = p(MW, W_u) \)  

The model is closed with the following relations:
- \( PB \) the probability of getting a job in the covered sector is inversely related to the excess labor supply \( (L^C - D^C) \); hence
  \[
  PB = \frac{PB(L^C, D^C)}{L^C - D^C + \alpha} \quad (7)
  \]

The term \( \alpha \) guarantees that \( PB \) lies between 0 and 1; \( \alpha > 0 \) and \( 0 < PB < 1 \).

Necessary to close the model also is the equality of the supply of and the demand for labor in the uncovered sector: \( D^U = L^U \)  

Also we have the following identities:
\[
N = N^C + N^U \quad (9)
\]
\[
L = L^C + L^U \quad (10)
\]
The identities (9) and (10) state that total employment (N) or Labor Force (L) is the sum of employment (labor force) in the two sectors.

Comparative Static Analysis of the Model: The Effects on Employment of a Change in the MW

From equations (2) to (10) the signs of the partial derivatives are assumed to be as follows:

\[
\frac{\partial L^C}{\partial W_0} = L^C_m < 0; \quad \frac{\partial L^C}{\partial MW} = L^C_m > 0; \quad \frac{\partial L^U}{\partial MW} = L^U_m < 0
\]

\[
\frac{\partial L^C}{\partial P_B} = L^C_p < 0; \quad \frac{\partial L^U}{\partial P_B} = L^U_p < 0
\]

\[
\frac{\partial L^C}{\partial MW} = D^C_m < 0; \quad \frac{\partial L^U}{\partial P} = D^U_p > 0
\]

\[
\frac{\partial P_m}{\partial MW} = P_m > 0; \quad \frac{\partial P}{\partial W_0} = P_w < 0.
\]

If we combine equations:

\[
D^C = D^C(MW, P) \quad (4)
\]

\[
D^U = D^U(W_0, P) \quad (5)
\]

and \( N = N^C + N^U \) \quad (9)

total employment (N) can be expressed as:

\[
N = D^C(MW, P) + D^U(W_0, P) \quad (11)
\]
Interpretation of equation 12

The term $D_m^C$ indicates the direct impact of an increase in the MW on total employment $N$. Recall that by assumption $D_m^C < 0$, implying that the higher the MW, the less the labor demand in the covered sector; and as a result employment declines.

The second term $D_u^W \frac{\partial W_u}{\partial MW}$ captures the effect of the increase in the MW in the uncovered sector. The higher wage in the covered sector will attract some workers from the uncovered sector into the covered one. At the same time the increased labor supply in the covered sector lowers the probability ($P_B$) of getting a job there and hence drives some workers into the uncovered sector. The crucial point is that once the spillover effects are considered, the wage rate ($W_u$) in the uncovered sector may rise or fall. Therefore, the sign of the second term is undeterminate. A rise in $W_u$ will have a negative effect on employment and vice-versa.

The third term $(D_u^C - D_u^W) \frac{\partial P}{\partial MW}$ is the last impact of a change in the MW on the employment. A change in the MW alters the relative
product price \( (p) \) and consequently alters labor demand in each of the two sectors.

In partial-equilibrium analysis, this overall effect is ignored because we are holding other things constant that are not in fact constant. In such a partial analysis, \( D_p^c = D_p^u = 0 \); hence we have an unambiguous negative effect of the MW increase on employment on one hand. In general equilibrium on the other hand, \( (D_p^c + D_p^u) > 0 \) and therefore the impact of MW on \( N \) is undeterminate since \( (D_p^c + D_p^u) \frac{\partial p}{\partial MW} \) may be either positive or negative. If positive, this term may exceed the sum of the first two; then in response to a change in relative product price resulting from a change in the MW, labor demand in the uncovered sector will increase sufficiently to offset the disemployment effect in the covered sector.\(^{12}\)

To summarize, in a two-sector competitive model, the impact of a change in the MW on Employment is theoretically ambiguous when the spillover effects are taken into consideration. Most previous studies failed to acknowledge this fact and found inaccurate results. For example, by omitting the female labor supply, those studies failed to examine the most fundamental change in the labor market in the United States since 1945: the increased labor force participation of women. Accordingly, previous studies did not answer the crucial policy question: Have women been taking jobs away from teenagers? After this demonstration of the ambiguity of the impact of the MW on Employment, we can proceed to the empirical estimation.
The Equations of the Empirical Model and Estimation Methodology

Using Equation (11), specified as \( N = D^C(MW, P) + D^U(Wu, P) \), where \( N \) is defined as Total Employment in both the covered and uncovered sectors, one can generalize \( N \) by including the unemployment generated in both sectors by the imposition of the MW. \( N \) can therefore be redefined as a measure of Labor Force Status (labelled \( Y \)), i.e., employment and unemployment.

The effects of the MW on the Labor Force status can hence be tested. Such effects have been studied extensively for youths.

Most previous research used a single-equation model of the form:
\[
Y = f(MW, D, Z)
\]
where -
- \( Y \) is the dependent variable and a measure of labor force status.
- \( MW \) is a measure of the minimum wage.
- \( D \) represents a business cycle variable; and
- \( Z \) is a list of the other socio-economic variables.

Table 1 (p. 9) presents a summary of selected empirical studies. On balance, it is found that the effect of a 10% increase in the MW is estimated to result in a 1-3% reduction in total teenage employment (Brown, Gilroy, Kohen, 1981). Such low results may be due to the omission of relevant explanatory variables in the equation.

The question arises: which 'control' variables, i.e., variables other than MW, should be included in the estimating equations?

Although there is general agreement that other explanatory variables should be introduced in the equations, there exists a comparable wide disagreement as to the appropriateness of
incorporating supply-side variables in that direction (Adie-Gallaway, 1973; Lovell, 1973). This important issue has yet to be resolved and the current research is a tentative step in that direction.

Mention was made earlier about the new development that occurred in the American labor force: the emergence of a strong female labor force participation rate. To the extent that women, especially married women working part-time are likely to be substitutes for teenagers (Hamermesh, 1979), it is important to add a measure of women's labor supply in the estimating equation.

Another major factor thought to influence the labor force status is the wage-inflation/price-inflation spiral. According to Ehrenberg (1981), "Perhaps the most pressing economic problem today is the wage-price unemployment issue." Hence a wage-inflation equation must be specified in the model.

A new approach to the problem: A model of simultaneous equations of minimum wage, unemployment, inflation and female labor supply.

In this section, we develop a model that fully takes into account wage-inflation, female labor supply and unemployment.

Equation 1: The employment/unemployment equation is a variant of the Charles Brown et al. model. The general form is \( Y = f(M, D, Z) \), where \( Y \) is as before a measure of labor force status; \( Y \) is defined in the present study as the teenage employment, unemployment and labor force participation rate alternatively.
MW is a measure of the minimum wage.

AHE is the Average Hourly Earnings measure. It standardizes for the erosion due to rising prices and growing productivity.

D is the aggregate demand, standing for business cycle variables which account for changes in the level of economic activity.

Z is a host of other explanatory variables to control for labor supply such as school enrollment, participation in the armed forced, age, sex, race. For the purpose of comparability, we propose a modified version of the Brown et al. equation, for the same period 1954-1979 with quarterly data:

\[ Y = \beta_0 + \beta_1 \text{KIMW} + \beta_2 W + \beta_3 \text{FLS} + \beta_4 \text{POP} + \beta_5 \text{EDP} + \beta_6 \text{AEP} + \beta_7 \text{EFFTPP} + \beta_8 \text{PCWEL} + \beta_9 T + \beta_{10} TQ5 + \beta_{11} Q2 + \beta_{12} Q3 + \beta_{13} Q4 + c \]

Definition of Variables.

1. The dependent variable (Y) could be defined in several ways. In practice, the ratio of employment to population (E/P) is most often used (Ragan, 1979).

For our purpose, however, we will use alternative definitions of Y. Specifically, the teenage unemployment rate (TNUR) will be introduced in addition to the employment population ratio (EMP) for the youth subgroup employed.

2. KIMW is the popular Kaitz index of the minimum wage, using teenage unemployment as weight. It is the MW deflated by average hourly earnings to take into account the fact that the MW is not important
per se but is important in relation to other wage rates. In addition, one must consider the coverage factor. The MW should have a greater influence the greater the number of workers covered by the law. For this reason, the MW variable is weighted by the fraction of workers subject to MW legislation.

\[
K_{\text{MW}} = \sum_{i=1}^{n} \left( \frac{E_i}{AHE_i} \right) \left( \frac{MW_i + MW^*}{AHE} \right)
\]

-E = non-agricultural employment
-MW = nominal value of the minimum wage.
-AHE = some broad measure of average earnings of nonsupervisory workers.

For example, average hourly earnings in either manufacturing or the private economy.
-C = proportion of nonsupervisory workers covered by the basic MW.
-MW* = minimum wage for newly covered workers.
-C* = proportion of workers for newly covered workers.
-i = major industry division.
-t = total private nonagricultural economy.

3 - WI = Wage Inflation
4 - FLS = women's labor supply.
(WI and FLS are specified in the next pages.)
5 - POP = Ratio of teenage population to total civilian population.
6 - ED = ratio of teenagers enrolled in school to the teenage civilian population.
7 - AFP = The ratio of teenagers in the armed forces to the total teenage population.
8 - EFTPP = The ratio of enrollment in federal training and employment programs of those aged 16-21 to the civilian population aged 16-29.

9 - PCWFL = Price-deflated "welfare" aid to families with dependent children, food stamps and commodity distribution programs benefit per woman of child-bearing age (16-44).

10 - T = A linear time trend. This time trend is included to control for the impact of technological change on firms' demand for teenage labor.

11 - TSQ = Time squared.

12, 13, 14 = Q2, Q3, Q4 respectively are dummy variables for the second, third and fourth quarter. The first quarter is the base.

Equation 2: The Impact of the MW on Wage and Price-Inflation; The Wage-Inflation Equation.

This section deals with inflation and other macroeconomic aspects of the MW legislation. Specifically, we analyze the potential inflationary impact of increases in the MW and the effect of such increases on the wages of employees and consequently on their labor force status.

Brigitte Sellekaerts (1981) measures the direct and indirect wage and price inflation impact of the MW, with particular emphasis on wage inflation. Sellekaerts uses the framework of a quarterly econometric model that captures the economic interactions relevant to disentangle the aggregate direct and indirect impact of the MW increases on wage and price inflation.
The effect of the MW changes on wage-inflation, can be easily understood if the process is viewed as taking place in several stages.

Stage 1: In response to higher wages and therefore higher labor costs, firms attempt to raise their product prices and require employees to increase production in the short-run.

Stage 2: A "wage-comparison" or "ripple effect" may occur. This may be due to a quick upward adjustment in the hourly wage payment of workers who already were making more than the new MW level prior to its enactment. Such a "ripple effect" may be caused by specific labor contract clauses contingent upon the MW.

Stage 3: A direct increase occurs also in the hourly earnings of workers who were previously paid less than the new MW.

Stage 4: As businesses are faced with a given labor/capital ratio, they adjust the level and the mix of their inputs demand. The mix consists of low-skilled labor, high-skilled labor, capital goods and raw materials used in the production process.

To minimize costs, the new input combination may involve an increase in the use of capital, a reduction in low-skilled workers and an increase in high-skilled labor.

Stage 5: The new employment equilibrium level, combined with the new workers' earnings produces a new income level, a new aggregate demand, and after some adjustment, affects the production level.

Stage 6: Finally, the inflation and unemployment rates, consistent with the new equilibrium levels of income, output, costs,
demand for goods and factor demand and supply may in turn, in time, raise the AHE via the "spill over effect."

The figure on the next page presents the transmission mechanism of the MW effect to wage/price inflation.
Figure 4: Transmission of the MW Effects to Wage/Price Inflation
Measurement of the Inflation Impact of the Minimum Wage in Previous Studies

A number of past studies have examined the inflation impact of the MW. Sellekaerts (1980) presents one of the most notable efforts made to quantify the average size of the indirect economic spillover effect of a given MW change on wage inflation.

Table 4 displays selected existing studies of the impact of the MW on wage inflation.

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Methodology</th>
<th>Direct Impact %</th>
<th>Total Impact on Wage (W) or Price (P) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPS14</td>
<td>Wage determinations</td>
<td>.125</td>
<td>.15 (P)</td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Gramlich</td>
<td>Wage determination model</td>
<td>.28</td>
<td>.28 (W)</td>
</tr>
<tr>
<td>1976</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. Fortin</td>
<td>Industry wage bills</td>
<td>.4</td>
<td>.6 (P)</td>
</tr>
<tr>
<td>1978</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Dol.</td>
<td>Wage bill</td>
<td>.37</td>
<td>.37 (W)</td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sellekaerts</td>
<td>Wage determination relations</td>
<td>.26</td>
<td>.65 (W)</td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Comparison of the Direct and Total Inflation Impact of a 10% Increase in the Level of the MW in Various Studies

Source: B. Sellekaerts, MW Study Commission, Vol. VI, p. 4.
Two lessons can be learned from these past works. First, they generally focus on one or a few of the several steps in the transmission mechanism summarized in Figure 4. The consequence is that wage comparison and other spill-over effects may not have been properly evaluated. Second, in cases where efforts were made to consider all steps, MPS (1971) Gramlich (1976), the impact of the MW was not traced out to capture the spill-over effects on price interactions and productivity effect.

The typical estimated relationship is of the following form:

$$W_t = f(u_t, \sum MW_{t-1}, P_t, Z)$$

Where:

- $W_t$ is the percent change in the average hourly earnings.
- $u$ is the unemployment rate.
- MW is the percent change in the MW rate.
- $P$ represents the percent change in the consumer price index (CPI).
- $Z$ denotes other variables (e.g., productivity).

Interpretation of Results: From Table 2, one can read that a 10% rise in the MW would entail a direct wage effect of .4% for Fortin (1978) and .28% for Gramlich and a .6% effect on Price and .28% on wage as total impact, respectively. These results must be interpreted with caution, however. Several methodological shortcomings must be addressed if the MW impacts are assessed by wage determination models. (a) The AHE (average hourly earnings) are a weighted average of both the MW of workers and those of other workers. As a consequence, econometric relationships that relate changes in AHE as a
dependent variable to changes in the MW as an independent variable are subject to the fallacy of composition, which relies on a "part" to explain the "whole." Accordingly biased and therefore unreliable estimate of the MW effect on AHE will be obtained. (b) Collinearity exists between the variable that represents inflation and the MW. (c) Finally, the other explanatory variables, unemployment variable, productivity and lagged consumer price index are subject to simultaneity biases since they are affected by changes in the MW.

The severity of the shortcomings of the simple wage determination model outlined above led Sellerkaerts (1981) to propose a new approach to break the multi-collinearity problem.

The Wage-Inflation Equation: The aggregate short-run wage inflation effect of the MW. Consistent with the theoretical foundation of aggregate wage determination, the basic estimating equation can be expressed as:

\[ W_t = \alpha_0 + \alpha_1 \left( \frac{1}{\text{TNUR}} \right) + \alpha_2 \text{PC} \cdot \text{MW} + \sum_{i} \alpha_i \text{PC} \cdot \text{CPI}_{t-i} + \alpha_4 \text{GNP} + \nu. \]

Definition of Variables

\( W_t \), the measure of wage inflation is defined as the annual percentage rate of increase in some composite measure of hourly earnings in the economy.

\( \text{TNUR} \) is the teenage unemployment rate. It is used to define the unemployment variable because we are interested mainly in the MW impact on youths' labor force status. \( \text{TNUR} \) is inversely related to the wage-inflation variable.
PCKIMW is the percent change in the Kaitz index of the minimum wage.

PC CPI is the percent change in the consumer price index.

GNP, the gross national product, describes the level of economic activity.

Under the constraint that the sum of the coefficients $\alpha_i$ is unity, we can avoid the multicollinearity problem between the wage variable and price. By so doing, the effect of the MW changes in other than the impact quarter is no longer insignificant; therefore we expect the inclusion of wage-inflation equation to affect the MW coefficient on employment/unemployment, with the magnitude and the direction to be determined empirically.

Equation 3: The Female Labor Supply

The analysis of labor supply has an important bearing on a wide variety of issues of economic and social policy. Controversies about unemployment, especially youth unemployment, wage rigidity and other macroeconomic problems often raise questions the study of labor supply could provide some answers for. In the past two decades or so, this has resulted in an enormous body of theoretical and empirical work, including the emerging strength of female labor supply.

The aim of this section is to examine the major determinants of the labor supply function of women, especially of married women. Such a function can be included in the estimating model and tested in order to investigate how an increase in the female labor supply can affect the teenage labor force status.
A Review of the Literature on the Female Labor Supply

Much of the theory of female labor force participation is attributable to Jacob Mincer (1962) and its application to married women is due to Glen Cain (1966). As Mincer (op. cit.) observed, the most important phenomena in the American labor force is the secular trend in the Labor Force Participation Rate (LFPR) of married women. Indeed, over the past 30 years, there has been a tremendous increase in the number of women entering the labor force. Several factors explain such a trend.

First is a pure economic factor in the form of financial pressure. The consumption level has increased in the U.S. with a concomitant rise in the break-even level of income. To fill the gap between actual income and desired consumption, wives are forced into the marketplace to complement their husband's income by a second salary.

The Second factor concerns the increase in the education level of women. Since more and more women are attending college, there are more women skilled for primary jobs. The possibility of promotion and achievement that characterizes entry level jobs attract a great number of women to remain in the labor force for a longer period and take less time off for maternity.

Third is the shift from heavy and dirty industrial jobs to more service industry. These changes in the job structure from manufacturing toward clerical and technical (i.e., expanded white-collar and professional job opportunity) are also a major reason for women to stay in the labor force.
The fourth factor is the availability of time-saving home technology. Appliances have enabled women to spend less time on traditional work in the house and consequently have given them more time for the marketplace.

The fifth reason concerns recent social changes such as anti-discrimination laws, affirmative action, women's liberation movement for sexual equality, which have contributed to the acceptability of women working in the marketplace.

Finally, the development of child care services has reduced the time spent in child rearing. In addition, the decline in the male labor force participation rate has resulted in an increase in the LFPR of women. The male LFPR decline is primarily due to early retirement (case of older men) and more years of schooling (younger men).

Because of such trends, it is important to formulate the labor supply not just for an individual in isolation, but for a household. Different studies on the family labor supply have been conducted. After Mincer's (op. cit.) seminal work which provided the theoretical framework, several empirical studies took place. These studies are based mainly on the cross sectional data from the 1960 census, and dealt with the LFPR of Black and/or White women and have focused primarily on married women.

Glen Cain (1966) analyzed the labor force behavior of white and non-white married women. William Bowen and Aldrich Finegan (1969) examined the labor force behavior of black and white women, especially married women with regard to different responses to specified variables. James Sweet (1973) focused on the employment behavior of
black and non-black with respect to variables such as family composition and an indicator of financial pressure (husband's income).

Early results by Clarence Long (1958) from cross-sectional analysis by city showed that the higher the earnings of the husband, the lower the LFPR of the married women. The result was not found to be very meaningful because the wife's wage effect on her participation was not controlled for. For that reason, such a study is termed a "male chauvinistic" model. In fact, the wife's participation seems to be positively related to her own wage rate. It is thus necessary to include both the wage of the husband and that of the wife. Such a model may be called the "Family Utility-Family Budget constraint" model. Here the utility that is maximized is total family utility, assumed to depend on total family consumption, on the leisure time of each family member, and on other socio-economic variables like the number of children and the education level; so that utility is maximized subject to a family budget constraint.

This total family utility model, which was first developed by Kosters (1966) and has proved to be by far the most popular treatment of family labor supply behavior. To show just how the family labor supply model works, suppose that all family members' wage rate rises equi-proportionally because of the mandatory minimum wage. Furthermore, if we assume that the prices of all consumer goods stay the same, one may invoke Hicks' composite good theorem and treat the aggregate of the family members' leisure time and the aggregate of the family consumption expenditure as two composite goods—we may label L and C respectively. Then when the wage rate rises as the result of
the imposition of a MW for each member of the family, the income effect tends to increase L following the wage increase. An income "compensated" equi-proportionate rise in all members' wage rate would always reduce the composite L and increase the composite C. Moreover, because this change in wage rate increases consumption spending if we assume normal goods, total family earnings must increase to account for the substitution effect of the rise in the wage; hence the need for the other member (wife) to enter the labor force.

This model broadens the simple individual labor supply analysis in many respects. First there is the substitution effect on the family member's labor supply of an increase in that family member's own wage: this is the well-known own-substitution effect. Second, there is the effect on the family member's labor supply of an income compensated rise in the wage of the other family members: the cross-substitution effect. Such an effect is positive or negative depending on whether the leisure times of the family members are complement or substitute. Regardless of the sign of these cross-substitution effects, the structure of the model is such that they will always be equal. As Ashenfelter and Heckman (op. cit., p. 75) put it, the model implies that "an income compensated change in the husband's wage rate has the same effect on the wife's work effort as an income compensated change in the wife's wage rate has on the husband's work effort." Finally, if the cross-substitution effects are zero for all family members the only effect on one member's labor supply of a rise in another member's wage is a pure income effect. At
the outset, if the outcome of the work substitution effect, cross-substitution effect and income effect are such that the wife is attracted into the marketplace, she still faces the problem of getting a job. In addition, if we assume that only low-wage, low-skill jobs are available, she may compete with a special subgroup of jobseekers: TEENAGERS, seeking jobs of similar characteristics, because of lack of experience and adequate skills.

To evaluate how the women's labor supply would affect teenage unemployment (and vice versa), we suggest a variant of Mincer's specification. Mincer's model includes a measure of married women's labor supply as the dependent variable and a host of independent variables as presented below.

\[ FLS = C_0 + C_1 KIMW + C_2 TNUR + C_3 EDUC + C_4 INUSB + C_5 CHLD + U \]

Definition of Variables

**Dependent Variable:**

FLS, the female labor supply, is defined as the ratio of employed females, 20 years of age (and older) to the female civilian labor force 16 years of age and older.

**Independent Variables:**

KIMW is Kaitz index of the MW; it serves as a proxy for women's reservation wage.

TNUR indicates the teenage unemployment rate. The major emphasis of this study is on the relationship between the teenage labor force and the MW, i.e., how the MW at the outset affects youths' labor
status, controlling for relevant supply variables such as FLS. It is thus important to incorporate the teenage unemployment rate in the FLS specification to adequately assess how and by how much such relationships will influence the MW coefficient in the basic equation.18

EDUC is the education level of married women (completed high school or better).

IHUSB represents the median income of the husband; it serves as a measure of financial pressure on the wife to work in the marketplace. The proposition that financial pressure is related to the LFPR of women is supported by the empirical findings of Mincer (op. cit.). Indeed, in a nationwide sample survey of women with respect to factors influencing their decision to participate or to withdraw from the labor force, economic necessity is found to be the reason most frequently given as the dominant motive for entering the labor force.

CHILD indicates the number of children under 6 years of age.

From a theoretical viewpoint, we expect FLS to be positively related to the MW variable, to education and positively correlated to teenage unemployment; FLS is expected on the contrary to be negatively related to the husband's income and to the number of children.

Formally, we have:

\[ \frac{\partial \text{FLS}}{\partial \text{IMW}} > 0 \quad \frac{\partial \text{FLS}}{\partial \text{EDUC}} > 0 \quad \frac{\partial \text{FLS}}{\partial \text{IHUSB}} < 0 \]

\[ \frac{\partial \text{FLS}}{\partial \text{TNUR}} > 0 \quad \frac{\partial \text{FLS}}{\partial \text{CHILD}} > 0 \]

But as Michael Keely points out, pure theory rarely provides answers to important policy questions; only empirical research is
definitive because many policy issues hinge on the magnitude of the effects of changes in the MW rates on Teenage labor force status regarding the impact of the MW on Teenage employment/unemployment. Therefore, we now turn to the empirical estimation.
Endnotes

1. “Teenagers” means individuals 16-19 years old; in what follows, “teenagers” and “youths” are used interchangeably.

2. Effective minimum wage is a wage above what would have prevailed in the absence of such legislation.


6. This is so because of the new way of counting the unemployed (Summers Lawrence 1981).


8. This type of model is presented by Adie (1971, 1973).


10. Ragan called this a general-equilibrium effect; we believe however that the term “spillover effect” is more appropriate since we are dealing here with interactions of segments of the labor market (covered and uncovered), not with the full interaction between all markets of the economy as a whole.

11. Specification of this functional form in no way alters the findings of this model. The sole reason for specifying PB as in equation (7) is that it reduces the complexity of various expressions; the term a in the denominator guarantees that PB assumes a value between 0 and 1.

12. The values of $a_{Wu}$, $a_{PB}$, and $a_{PB}$ can be derived by $a_{MW}$, $a_{MW}$, and $a_{MW}$ totally differentiating equations (3), (5), and (8) and using Cramer’s rule. Since we are primarily concerned with the impact of a change of the MW on Employment, we have set other differentiations aside.

13. As Ragan (1977) observed, the fraction of the teenage population covered is superior, at least conceptually. The reason is that the impact of changes in coverage depends on where they occur. A change in teenage-intensive industry, such as retail trade, should have a larger impact on teenage employment than a change in
adult-intensive industry such as manufacturing. The actual coverage of teenage is not known; the coverage variable of this study is based on estimated teenage coverage by Brown et al. (1981).

12MPS is the MIT-Penn Social Science Research Council; it uses a quarterly econometric model of the U.S. Economy.


16For an example of the use of the male chauvinistic model, see Bowen and Finegan (1965, 1966, 1969).

17It is assumed that all family members work in the covered sector.

18That is equation 1 developed earlier.


CHAPTER III

SAMPLE DATA SOURCES AND EMPIRICAL FINDINGS

This chapter examines the impact of the minimum wage on Teenage Labor Force Status, controlling simultaneously for the female labor supply (FLS) and wage-inflation (WI).

Sample Data Sources

As did most previous studies listed in Table 1 (page 7), the data are collected from monthly series of the Current Population Survey (CPS). The data for the three basic equations of teenage employment, teenage unemployment and teenage labor force participation are obtained mainly from the CPS.¹

Wage-inflation and female labor supply data were partially drawn from the CPS and partially from the Citibank data base called Citibase.²

To make our results comparable with previous ones, we used quarterly data (quarterly averages of the monthly observations). The period of study is from the first quarter of 1954 to the fourth quarter of 1959.

List of Variables

A major concern in previous empirical works was to provide an answer to the questions about what definition of the labor force status to use as a dependent variable. In order to test the
performance of alternative definitions of the labor force status, we analyze the estimating equations using the three definitions of the labor force status of teenagers: Teenage employment (TEMP), teenage unemployment rate (TNUR) and teenage labor force participation (TLFP) respectively.

A final set of equations makes the estimation using simultaneous equations with the two-stage least squares technique (2SLS).

Table 5 presents the list of all variables utilized in all the equations.

Table 5: List of Variables.

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMP:</td>
<td>Teenage employment; ratio of civilian employment to the civilian population for teenagers (16-19).</td>
</tr>
<tr>
<td>MW:</td>
<td>Minimum wage index: the Kaitz index of the minimum wage; it is the product of the relative level of the minimum wage (compared with average hourly earnings) times the fraction of teenagers subject to the minimum wage provision (coverage).</td>
</tr>
<tr>
<td>PRIMEUR:</td>
<td>Prime age employment rate for males aged 24-54.</td>
</tr>
<tr>
<td>SY:</td>
<td>The fraction of the teenagers aged 16-19 who are actually 16-17.</td>
</tr>
<tr>
<td>AFP:</td>
<td>The ratio of teenagers in the armed forces to the total teenage population.</td>
</tr>
<tr>
<td>EFTPP:</td>
<td>The ratio of enrollments in federal training and employment programs for youths 16-21 years old.</td>
</tr>
<tr>
<td>POP:</td>
<td>The ratio of the teenage civilian population to the total civilian population.</td>
</tr>
<tr>
<td>EDP:</td>
<td>The ratio of teenagers enrolled in school to teenage civilian population.</td>
</tr>
</tbody>
</table>
9 - Pcwel: Price-deflated welfare variable (Aid to Families with Dependent Children; Food Stamp programs).
10 - T: A linear time trend.
11 - TSQ: Time squared (to capture technological change).
12 - Q2 Q3 Q4 Dummy variables for the second, third and fourth quarters.
13 - FLS: Female labor supply: ratio of employed females 20 years of age and older to the civilian labor force.
14 - WI: Measure of wage-inflation: annual percentage rate of increase in the average hourly earning.
15 - TNUR Teenage unemployment rate: ratio of civilian unemployment to civilian labor force for teenagers.
16 - TLFP Teenage labor force participation rate: ratio of civilian labor force to civilian population for teenagers.
17 - PCMW The percent change in the Kaitz index of the minimum wage.
18 - PINFL The price inflation rate: the percent change in the consumer price index.
20 - EDUC: The median years of school completed.
21 - IHusb Median income of husband (quarterly).
22 - CHILD Number of children under 6 years of age.
23 - LBOUTU Labor Productivity.
Empirical Findings

The findings are organized in three major parts, each part using a new definition of labor force status: employment, unemployment and labor force participation respectively.

Each part consists of three sections:

Section 1 is a replication of Professor Brown et al. single equation model.

Section 2 extends the Brown et al. model by introducing new control variables, female labor supply and wage-inflation as exogenous variables.

Section 3 presents a simultaneous equations analysis, with the two-stage least squares technique (2SLS) with the inclusion of FL and WI as endogenous variables.

Part I: Employment Equation

Section 1: Replication of the Professor Brown et al. Single Equation Model

In this section we examine the effect of an increase in the minimum wage on teenage employment. Different specifications and functional forms are considered, following the Brown et al. framework.

The basic equation is:

\[ \text{TEMP} = \beta_0 + \beta_1 \text{MW} + \beta_2 \text{PRIMEUR} + \beta_3 \text{SY} + \beta_4 \text{AFP} + \beta_5 \text{EIFTP} + \beta_6 \text{POP} + \beta_7 T + \beta_8 T5Q + \beta_9 Q2 + \beta_{10} Q3 + \beta_{11} Q4 + e. \]
Table 6: Estimated impact of an increase in the MW on teenage employment: Basic equation OLS$^8$ Linear.

\[
\text{EMP} = 0.794 - 0.14089 \text{MW} - 0.54865 \text{Y} + 0.07288 \text{EFTPP} - 0.8112 \text{POP} + 0.0728 \text{EFP} - 0.8112 \text{POP} + 0.000921 + 0.000020515 + 0.03710 + 0.0158904
\]

\[\begin{array}{c}
\text{(3.08)} \\
\text{(5.68)} \\
\text{(.256)} \\
\text{(1.36)} \\
\text{(2.036)} \\
\text{(9.57)} \\
\text{(1.74)} \\
\text{(5.44)} \\
\text{(9.885)} \\
\text{(24.12)} \\
\text{(4.020)}
\end{array}\]

\[R^2 = .95 \quad \hat{R}^2 = .94 \quad F(11, 92) = 176.46 \quad DW = .8125\]

(* t-statistics are in parentheses.)

We can glean from Table 6 above that the coefficient of the minimum wage is negative (-0.1408) and statistically significant (t-value = 2.56).

Based on such findings, previous research concluded that the MW is the determinant of the reduction in the teenage employment.

However, the very low Durbin-Watson statistics (DW = .825) shows considerable serial correlation and hence confers little meaning to such results. The results of different specifications of the basic employment equation are tabulated in Appendix A. Each specification depends upon which control variables are included or excluded from the above basic equation.

To purge such serial correlation from the result, we estimated the GLS$^9$ equation in order to test how robust the OLS results are.
Table 1: Estimated impact of an increase in the MW on teenage employment: Basic equation; GLS linear.

\[
\begin{align*}
\text{TEMP} & = 0.7304 - 0.06307\text{MW} - 1.1191\text{PRIMEUR} - 0.509654 - 0.509654 \\
& - 0.567\text{EFTPP} - 0.50\text{BOPOP} + 0.465\text{AFP} - 0.001114\text{T} + 0.0000212\text{TSQ} + 0.04002 + \\
& 0.10795\text{Q}_{3} + 0.0197\text{Q}_{4} \\
& (30.26) \quad (6.16)
\end{align*}
\]

\[
R^2 = 0.956 \quad \bar{R}^2 = 0.953 \quad F(11; 91) = 331.04
\]

\[
\text{DW} = 1.922
\]

\[
\text{RHO} = 0.708 \quad t(\text{RHO}) = 10.19
\]

From Table 7, we observe three major changes. First, the estimated coefficient of the MW is reduced from -0.1408 to -0.06307, which indicates an upward bias in the OLS estimates of about 0.0778. This implies that failure to correct for the serial correlation yields biased estimates. Second, the GLS results reveal that the MW coefficient is no longer statistically significant \((t = 0.99)\) while it was significant under OLS \((t = 3.08)\). Third, the two equations seem to perform well; both coefficients of determination adjusted for the degree of freedom are high \((0.96)\).

Still, in the interpretation of the results, greater emphasis should be put on the GLS estimates. Appendix B displays the regression results of the different specifications under GLS.

Because the regression coefficients are sensitive to the units of measurement, it is difficult to compare with accuracy different estimates. To solve such a problem, the coefficient of the policy variable has been converted into elasticities and presented in Table 8.
Table 8: Elasticities: The estimated effect of a 10 percent increase in the MW on teenage employment.

<table>
<thead>
<tr>
<th>Basic equation</th>
<th>OLS linear</th>
<th>GLS linear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of MW</td>
<td>-1.02</td>
<td>-.45</td>
</tr>
<tr>
<td></td>
<td>(3.08)</td>
<td>(.99)</td>
</tr>
</tbody>
</table>

Table 8 shows that a 10% increase in the MW yields a 1.02% reduction in teenage employment under OLS linear and only 0.45% reduction under GLS. Such a differential in the estimates could lead to an inaccurate analysis if one relies on OLS results as did many previous studies.

Like Professor Brown et al., we tested the basic equation under several specifications in conjunction with different functional forms. The various specifications depend upon which control variables are included.

The functional forms used are OLS linear, GLS linear, OLS logarithmic and GLS logarithmic.

Table 9: Estimated impact of an increase in the MW on teenage employment; basic equation OLS logarithmic.

\[
\ln \text{TEMP} = a_0 + a_1 \ln \text{MW} + a_2 \ln \text{PRIMEUR} + a_3 \ln \text{POP} + a_4 \text{SY} + a_5 \text{AFP} + a_6 \text{EFTPP} + a_7 T + a_8 T^2 + a_9 Q_2 + a_{10} Q_3 + a_{11} Q_4 + \epsilon
\]

\[
\begin{align*}
\ln \text{TEMP} &= 1.699 - 0.10609 \ln \text{MW} - 0.1179 \ln \text{PRIMEUR} - 0.32931 \ln \text{POP} - 1.3085 \text{SY} + 0.1065 \text{AFP} - 0.1135 \text{EFTPP} - 0.00093 T + 0.0000409 T^2 + 0.0945 Q_2 + 0.2344 Q_3 + 0.0438 Q_4 \\
& (3.24) \quad (9.52) \quad (2.08) \quad (5.38) \\
& (0.860) \quad (0.159) \quad (0.620) \quad (3.871) \quad (9.98) \\
R^2 &= 0.947 \quad R^2 &= 0.947 \quad F(11; 92) = 151.43 \\
D W &= 0.908
\]
The change in the functional form of the basic employment equation (OLS logarithmic) did not bring much change in the results as shown in Table 9. A 10 percent increase in the MW would yield a 1.06 percent reduction in teenage employment, close to the OLS linear form (1.02%). The basic statistics seem about identical, especially the very low Durbin-Watson statistics, indicating again the presence of serial correlation.

The complete regression results of the OLS logarithmic function combined with the different specifications are presented in Appendix C.

Based on the OLS logarithmic results, one concludes that a 10 percent increase in the MW leads to a reduction in teenage employment of 1.06 percent. But because of the very low Durbin-Watson statistics, we will resort again to the GLS technique.

Table 10: Estimated impact of an increase in the MW on teenage employment: Basic equation GLS logarithmic.

\[
\begin{align*}
\ln\text{TEMP} &= -1.976 - 0.0884\ln\text{MW} - 0.1187\ln\text{PRIMEUR} - 0.436\ln\text{POP} - 1.2925Y + \\
&\quad (1.918) \quad (6.06) \quad (1.33) \quad (3.076)
\end{align*}
\]

\[
\begin{align*}
0.524\text{AFP} - 1.807\text{FETPF} + 0.000786T + 0.0000321\text{TSQ} + 0.0968Q_2 + \\
&\quad (.427) \quad (3.74) \quad (.218) \quad (1.32) \quad (12.33)
\end{align*}
\]

\[
\begin{align*}
0.245Q_3 + 0.0463Q_4 \\
&\quad (24.90) \quad (5.33)
\end{align*}
\]

\[
R^2 = .967 \quad \bar{R}^2 = .963 \quad F(11; 91) = 239.89
\]

\[
\text{DW} = 2.021 \quad \text{RHO} = .647 \quad (0.63)
\]
Compared to the OLS logarithmic, the GLS produces a decline in the coefficient of the MW. A 10 percent increase in the MW will now lead to a 0.88% cut in teenage employment as opposed to 1.06% in the OLS logarithmic. The t-value has declined and the D-W has improved.

In the GLS logarithmic, the negative impact of the MW on teenage employment is minimal (-0.088). The full regression results of the GLS logarithmic in conjunction with the different specifications are displayed in Appendix D.

In Table 11 on the next page, we present the results in elasticities of a 10 percent increase in the MW on teenage employment, using the various specifications and functional forms concomitantly.

Except for the case of the basic equation with the welfare variable PCwel, in the logarithmic form LPcwel, all other effects of all different specifications have negligible impact. The welfare variable was added to the basic equation mainly to test whether an expansion in welfare benefits to eligible teenagers was a significant deterrent to employment. It affects the logarithmic equations but has virtually no effect in the linear version.

Likewise, the addition of EFTPP, the enrollment/population ratio in federal training programs, reduces the estimated MW effect in OLS equations, but has little effect in the GLS equations.

Overall, no noticeable change in the MW coefficient emerged. A 10 percent increase in the MW still would yield about 0.68% to 1.48% reduction in teenage employment.

How would such estimates react to new relevant control variables?
Table II: Elasticities: Estimated effect of a 10 percent increase in the minimum wage on teenage employment: various specifications and functional forms.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Effect of the</th>
<th>OLS Linear</th>
<th>GLS Linear</th>
<th>OLS Logarithmic</th>
<th>GLS Logarithmic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic</td>
<td>MW</td>
<td>-1.0205</td>
<td>-0.454</td>
<td>-1.060</td>
<td>-0.884</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.08)</td>
<td>(0.9908)</td>
<td>(3.249)</td>
<td>(1.918)</td>
</tr>
<tr>
<td>2. Basic - TSQ</td>
<td>MW</td>
<td>-0.0965</td>
<td>-0.48</td>
<td>-1.058</td>
<td>-0.931</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.5601)</td>
<td>(1.01)</td>
<td>(3.022)</td>
<td>(1.98)</td>
</tr>
<tr>
<td>3. Basic - SY</td>
<td>MW</td>
<td>-0.07188</td>
<td>-0.2717</td>
<td>-0.794</td>
<td>-0.688</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.909)</td>
<td>(0.555)</td>
<td>(2.158)</td>
<td>(1.377)</td>
</tr>
<tr>
<td>4. Basic - AFP</td>
<td>MW</td>
<td>-0.0816</td>
<td>-0.3674</td>
<td>-0.965</td>
<td>-0.837</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.549)</td>
<td>(1.787)</td>
<td>(3.147)</td>
<td>(1.873)</td>
</tr>
<tr>
<td>5. Basic - EFTPP</td>
<td>MW</td>
<td>-0.10178</td>
<td>-0.5139</td>
<td>-1.059</td>
<td>-0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.1025)</td>
<td>(1.123)</td>
<td>(3.26)</td>
<td>(2.03)</td>
</tr>
<tr>
<td>6. Basic - POP</td>
<td>MW</td>
<td>-0.1031</td>
<td>-0.4371</td>
<td>-1.126</td>
<td>-0.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.115)</td>
<td>(0.957)</td>
<td>(3.403)</td>
<td>(1.80)</td>
</tr>
<tr>
<td>7. Basic + Pnwel</td>
<td>MW</td>
<td>-1.1113</td>
<td>-0.5584</td>
<td>-1.599</td>
<td>-1.469</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.89)</td>
<td>(1.30)</td>
<td>(5.957)</td>
<td>(4.33)</td>
</tr>
<tr>
<td>8. Basic + EDP</td>
<td>MW</td>
<td>-0.752</td>
<td>-0.378</td>
<td>-0.825</td>
<td>-0.821</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.1006)</td>
<td>(0.828)</td>
<td>(2.508)</td>
<td>(1.819)</td>
</tr>
</tbody>
</table>
Section 2: Extension of the Basic Model: Introduction of Female Labor Supply (FLS) and Wage-inflation (WI).

The most fundamental change in the American labor force is the tremendous increase in the female labor supply. In this section, we introduce the female labor supply variable defined as the ratio of total employed females 20 years of age and over, to the total civilian female labor force 16 years of age and over. The data were obtained from Citibase and are all seasonally adjusted.

Wage-inflation is added to capture the effect of inflation on teenage employment. Table 12 below presents the results of the basic employment equation with the inclusion of the female labor supply as an exogeneous variable. Table 13 displays the results of the basic equation when the female labor supply and wage-inflation are both introduced.

The extended basic equation is:

\[
\text{TEMP} = b_0 + b_1 \text{MW} + b_2 \text{PRIMEUR} + b_3 \text{SY} + b_4 \text{AFP} + b_5 \text{EFTPP} + b_6 \text{POP} + b_7 T + b_8 \text{TSQ} + b_9 Q_2 + b_{10} Q_3 + b_{11} Q_4 + b_{12} \text{FLS} + \varepsilon.
\]

Table 12: Effect of an increase in the minimum wage on teenage employment in the presence of female labor supply:

<table>
<thead>
<tr>
<th>OLS Linear</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{TEMP} = 2.127 - 0.1268\text{MW} - 2.372\text{PRIMEUR} - 0.48454\text{SY} + 0.2005\text{AFP} - (3.006) (8.477) (5.387) (0.685)</td>
</tr>
</tbody>
</table>
| \begin{align*} 
& 2.627\text{POP} - 0.0594\text{EFTPP} - 0.000254T + 0.0000134\text{TSQ} + 0.0258Q_2 + (3.77) (0.226) (0.493) (5.934) (5.934) \\
& 0.0871Q_3 + 0.00349Q_4 - 1.336\text{FLS} \\
& (17.35) (0.748) (4.226) \\
\end{align*} |
| \begin{align*} 
& R^2 = 0.962 \\ 
& \bar{R}^2 = 0.957 \\ 
& F(12, 91) = 192.90 \\
& DW = 0.942 \\
\end{align*} |
Table 12 displays a strong negative impact of the female labor supply variable on the teenage employment level; -1.336 compared with the MW effect of -0.1268. Both variables are statistically significant with t-values of 4.22 for FLS and 3.006 for MW.

The negative sign of the FLS variable confirms previous studies that women and teenagers may compete for some jobs (Hamermesh, Grant, 1981). The magnitude of such an adverse effect is, however, stronger than we expected. Such an effect is questionable because of the very low Durbin-Watson statistic (DW = 0.942). It may be a spurious effect due to the presence of plausible serial correlation, the correction of which requires the GLS technique.

But before applying the GLS technique, we present the results of the same basic equation in the presence of both the female labor supply and wage-inflation.

Table 13: Basic equation extended to FLS and WI; OLS Linear

\[
\begin{align*}
\text{TEHP} &= 1.120 - 0.127\text{HW} - 2.357\text{PRIMEUR} - 0.483\text{SY} + 0.199\text{AFP} - 2.588\text{BPOP} - \\
&\quad 0.577\text{EFTPP} - 0.00273\text{T} + 0.0000133\text{TSQ} + 0.0263\text{Q2} + 0.0876\text{Q3} + \\
&\quad 0.00396\text{Q4} - 1.334\text{FLS} + 0.0692\text{WI} \\
R^2 &= 0.962, \quad \bar{R}^2 = 0.956, \quad F(13, 90) = 176.70
\end{align*}
\]
Adding wage-inflation brings little change to the regression coefficients; thus the interpretation would be identical to the one dealing with Table 12. However, wage inflation has a very small but positive effect on TEMP which is statistically insignificant. With the low DW statistic, one cannot draw any sensible conclusion. We will therefore correct for the serial correlation using GLS linear.

Table 14: Extended model in the presence of FLS and WI: GLS linear

<table>
<thead>
<tr>
<th>TEMP</th>
<th>1.74</th>
<th>-0.0284 BMW</th>
<th>-1.710 PRIMEUR</th>
<th>-0.04 SY</th>
<th>+ 0.098 AFP</th>
<th>- (0.456)</th>
<th>(6.707)</th>
<th>(2.59)</th>
<th>(0.215)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.654 EFTPP</td>
<td>-1.127 POP</td>
<td>-0.00161 IT</td>
<td>+ 0.000021 TSQ</td>
<td>+ 0.037 Q2</td>
<td>+ (3.88)</td>
<td>(0.82)</td>
<td>(1.10)</td>
<td>(2.19)</td>
<td>(10.03)</td>
</tr>
<tr>
<td>0.1003</td>
<td>+ 0.0126 Q2</td>
<td>-1.090 FLS</td>
<td>+ 0.0088 WI</td>
<td>(23.96)</td>
<td>(3.46)</td>
<td>(3.46)</td>
<td>(0.121)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$R^2 = 0.979 \quad \bar{R}^2 = 0.957 \quad F(13, 89) = 287.13$

$DW = 1.94$

$RHO = 0.73$

$T(RHO) = 10.84$

With the generalized least squares technique, when the female labor supply (FLS) and wage-inflation are present, we note quite a drastic change in the regression coefficients as displayed in Table 14.

The regression coefficient of the MW variable all but vanishes (-0.02848) and becomes statistically insignificant ($t$-value = 0.456). However, the adverse effect is still expressed by the negative sign of the MW; but with the magnitude greatly reduced and insignificant, one
cannot state that the MW is leading to a decisive reduction in teenage employment.

The female labor supply variable, though, still maintains a strong negative impact on teenage employment (-1.090); and such impact is statistically significant (t-value = 3.46).

Wage inflation, however, has a negligible impact on teenage employment. Its magnitude is small; its sign positive and statistically insignificant (0.0088) and (0.121) respectively. Therefore one cannot draw any meaningful conclusions as to whether wage-inflation affects teenage employment; although previous studies did conclude that MW has an effect on wage inflation.

On the whole, the female labor supply appears to influence teenage employment greatly. It is a major factor in the reduction of teenage employment.

For instance, if we convert the results into elasticities, one can say that a 10 percent increase in the female labor supply would lead to a 21.8 percent decrease in teenage employment. whereas a 10 percent increase in the MW is known to reduce teenage employment by 1 to 3 percent. For this reason, one should not attribute the decline in teenage employment to the MW alone so as to suggest a subminimum wage as a policy solution.

Moreover, it is well-known in the literature that female labor supply is determined by several variables and hence must be estimated endogenously. Similarly, wage-inflation is influenced by several variables we discussed in Chapter 2.
Accordingly, in order to measure the effect of the FLS and WI with accuracy, one must introduce these two variables as endogeneous. We will therefore turn to a simultaneous equations estimation in the next section.


In this section we present the joint estimation of teenage employment (TEMP), female labor supply (FLS) and wage-inflation (WI).

Two alternative techniques are used. The first is the strict two stage least squares (2 SLS) and the second is the instrumental variables method.

Since all the different specifications presented in sections 1 and 2 did not change the regression coefficients substantially, we will concentrate on the extended basic equation. On the other hand, considerable changes do emerge when one uses GLS instead of OLS; therefore we analyze the OLS-GLS gap to gauge the sensitivity of the estimates to the correction of serial correlation obtained by the GLS estimation. More weight must be put on the GLS results in the interpretation phase for adequate policy formulation, both in single equation estimation and in joint estimation.

We describe first the specification of the estimating equations of the two endogeneous variables, FLS and WI. The extended basic employment remains the same as before.
Female Labor Supply Equation

Chapter 2 describes the specification of the female labor supply equation as encountered in most previous studies.

We further add the welfare variable in order to gauge to what extent the welfare benefits create disincentives to work as found in past research.

\[
FLS = C_0 + C_1 \cdot MW + C_2 \cdot ITNUR + C_3 \cdot EDUC + C_4 \cdot IHUSB + C_5 \cdot CHLD + C_6 \cdot PCWEL + U
\]

All variables are defined in Chapter 2. However, income of husband (IHUSB) is expressed as the percentage change in the median income of husband, in real terms.

Table 15 shows the empirical results of the FLS equation using OLS linear.

Table 15: Estimation of the female labor supply: OLS linear.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW</td>
<td>0.0302</td>
<td>0.00068</td>
</tr>
<tr>
<td>IHUSB</td>
<td>0.0030</td>
<td>0.00088</td>
</tr>
<tr>
<td>ITNUR</td>
<td>-1.1912</td>
<td>0.048</td>
</tr>
<tr>
<td>EDUC</td>
<td>0.0162</td>
<td>0.0065</td>
</tr>
<tr>
<td>CHLD</td>
<td>-0.0002</td>
<td>0.0001</td>
</tr>
<tr>
<td>PCWEL</td>
<td>0.0027</td>
<td>0.0012</td>
</tr>
</tbody>
</table>

R^2 = 0.874  \quad \bar{R}^2 = 0.864  \quad F(6; 96) = 119.78  \quad DW = 0.745

The results in Table 15 confirm most previous studies: the higher MW index, other things being equal, will induce more women into the labor market. The impact seems not too strong but statistically significant.

Moreover, income of husband has the expected negative sign and is significant although of small magnitude.
On the other hand, the variable representing the number of children under 6 years of age has almost no notable effect on the female labor supply. Although it does have an adverse effect, it is of little significance both in magnitude and statistically. This may reveal the growing availability of child care services. Furthermore, this pattern perhaps reflects the fact that women now have fewer children on average. Consequently the number of children appears not to be as serious a hindrance to employment as before.

Education has a positive influence on female labor supply. This implies that the higher the education level of women, the more likely they are to be in the job market.

Likewise, the teenage unemployment rate is positively related to FLS. This supports Hamermesh and Grant (1981) findings that women and teenagers may be close substitutes for some jobs.

However, the most notable result is the statistically significant and strong negative impact of the welfare variable on FLS. The results demonstrate that welfare benefits are a deterrent to women to enter the labor market, ceteris paribus.

Overall, the signs of the FLS equation estimates reflect the expected behavior of the explanatory variables.

Wage-Inflation Equation

The second endogeneous variable we introduce is the wage-inflation. In Chapter 2, we analyzed the potential inflationary impact of increases in the minimum wage and what the effect such
increases might have on wages of employees; and consequently how this will affect their employment level, especially for youths.

The following equation is a modified version of Sellekaerts wage inflation equation.

\[ WI = g_0 + g_1PCMW + g_2ITNUR + g_3LBOUTU + g_4PINFL + g_5GNP + U \]

where PCMW is the percentage change in the minimum wage and PINFL is the percentage change in the consumer price index.

The next table puts forth the regression results.

Table 1b: Regression coefficients of the wage-inflation equation:
OLS Linear

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient</th>
<th>T-statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WI</td>
<td>0.0018</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>+ 0.0297PCMW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 0.577PINFL</td>
<td></td>
<td>2.95</td>
<td></td>
</tr>
<tr>
<td>+ 0.000107LBOUTU</td>
<td></td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>+ 0.00025ITNUR</td>
<td></td>
<td>0.318</td>
<td></td>
</tr>
<tr>
<td>+ 0.115GNP</td>
<td></td>
<td>0.107</td>
<td></td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.314</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D( \hat{W} )</td>
<td>2.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We observe that all the five explanatory variables have the anticipated positive impact on wage-inflation but only the percentage change in the minimum wage and the percentage change in price inflation are statistically significant.

How and to what extent will the endogeneously estimated values of wage-inflation and the female labor supply affect the results of the basic extended model? The answer resides in the simultaneous estimation to which we now turn.
Two-Stage Least Squares (2 SLS) Estimation of the Teenage Employment Equation.

In the 2 SLS procedure, we estimate the reduced-form equations by OLS. This involves regressing FLS and WI on their respective explanatory variables. We get the predicted value of FLS and WI. In the second stage, we regress TEMP on the exogeneous variables and the predicted values of FLS and WI.

The basic idea in the 2 SLS is to substitute for the endogeneous variables which are correlated with the residuals, a linear function of all the predetermined variables. Since these variables are uncorrelated in probability limit with the residuals, this 2 SLS procedure will yield consistent estimates of the parameters.

Applying the above 2 SLS method, we estimated the teenage employment equation. The use of the 2 SLS was justified by the fact that the system of equations is overidentified. The results are presented in Table 17.

Table 17: Estimated impact of an increase in the MW, FLS and WI on teenage employment. 2 SLS.

| TEMP = 1.60 - 0.942MW - 1.155PRIMEUR - 0.538SY + 0.384AFP - |
| (2.15) (8.09) (5.73) (1.37) |
| 0.0474EFP + 1.098POP - 0.00124T + 0.00001721SQ + 0.036Q2 + |
| (0.172) (1.877) (2.32) (4.66) (8.89) |
| 0.1015Q3 + 0.0167Q4 - 0.0902FLS + .28WI |
| (25.49) (4.27) (3.167) (3.03) |
| R² = 0.963 n² = 0.957 |
| F(13; 69) = 178.83 OW = 1.19 |
We can glean from the preceding table that two out of the three policy variables, the minimum wage index and the female labor supply have a significant negative impact on the teenage employment level. This is close to the single equation estimation results of the extended basic model. However, in the 2 SLS method, the magnitude of the FLS impact is reduced from -1.336 to -0.9025; that is a bias of -0.434 exists between the two methods. The other policy variable wage-inflation, still has a positive effect on the teenage employment, which becomes statistically significant and of a greater magnitude than that of the OLS case. Apparently, an increase in the wage attracts more teenagers into the job market.

Nevertheless, in the first stage of our 2 SLS procedure, the OLS estimation of the FLS equation has a very low Durbin-Watson statistic; a sign of the presence of serial correlation. Thus the above 2 SLS method results must be interpreted with caution.

To correct for such serial correlation, we resort again to the GLS estimation technique. The estimates of the 2 SLS purged from any serial correlation are put forth in Table 18.
Table 18: Estimated effect of an increase in the minimum wage, female labor supply and wage-inflation teenage employment: 2 SLS-FLS.

\[
\begin{align*}
\text{TEMP} &= 1.98 - 0.0484\text{MW} - 1.74\text{PRIMEUR} - 0.4775\text{SY} - 0.00873\text{AFP} - (0.776) (6.93) (3.02) (0.0198) \\
0.647\text{EFTPP} - 1.073\text{POP} - 0.00195\text{T} + 0.0000228\text{TSQ} + 0.0345\text{Q} + (3.82) (0.839) (1.41) (2.50) (10.42) \\
0.000\text{Q}3 + 0.012\text{Q}4 - 1.337\text{FLS} + 0.173\text{WI} + (24.21) (3.18) (4.05) (0.44) \\
\end{align*}
\]

\[R^2 = 0.980 \quad \bar{R}^2 = 0.977 \quad F(13; 88) = 300.68\]

\[\text{DW} = 1.89 \quad \text{RHO} = 0.69 \quad t(\text{RHO}) = 9.84\]

The generalized least squares estimation of the 2 SLS of the extended basic model reveals some interesting results. First, the direction of the impact of all three policy variables is maintained. An increase in the MW and an increase in the FLS both lead to a decline in teenage employment. Wage-inflation on the other hand continues to maintain a positive but insignificant effect on youth employment.

Second, the magnitude of the impact of the female labor supply variable is greater than in the previous 2 SLS without correction for serial correlation. The FLS coefficient is -1.337, close to the estimate of the extended OLS single equation results; it is also significant (t-value = 4.05).

Third, the most striking change emerges from the fact that the minimum wage variable is no longer statistically significant (t-value = 0.076) and the impact all but vanishes (-0.0484).

Fourth, the wage-inflation impact continues to be insignificant.
This is important in the analysis of the issue at hand. Indeed, the 2 SLS-GLS shows clearly that the increase in the female labor supply is the major factor in the decline in the teenage employment; and this decline is not due to an increase in the minimum wage alone. This will have important implications with respect to the issue of establishing a subminimum wage for teenagers.

But before coming to a firm conclusion, we will test the robust quality of the 2 SLS-GLS results using another method of simultaneous equations estimation.

**Instrumental Variables Estimation Method of the Simultaneous Equations**

As an alternative to the 2 SLS, we introduce the instrumental variable method. We argued earlier that in a regression equation where the explanatory variable is correlated with the residual, we cannot get consistent estimates for the parameters by using OLS. In a simultaneous equations model, this is no longer a problem because the exogeneous variables not in the equations can be used as instrumental variables.

Such a method is applied to our model and the results are displayed in Table 19.
Table 19: Estimated effects of an increase in MW, FLS and WI on teenage employment: Instrumental variable estimation.

\[
\text{TEMP} = 3.193 - 0.114704\text{MW} - 3.184\text{PRIHEUR} - 0.425\text{SY} - 0.1288\text{AFP} - \\
(2.478) (4.044) (4.18) (0.36)
\]

\[
3.92\text{POP} - 0.16\text{EFTPP} + 0.000149\text{T} + 0.000008\text{TSQ} + 0.0178\text{Q2} + \\
(4.19) (0.559) (0.240) (1.55) (2.83)
\]

\[
0.077\text{Q3} - 0.0054\text{Q4} - 2.427\text{FPP} + 0.197\text{WI} \\
(10.71) (0.808) (4.044) (0.377)
\]

\[
\text{DW} = 1.1163
\]

An examination of Table 19 exhibits some features noticed earlier. The MW and the FLS have adverse effects on teenage employment; both are significant, but the FLS has a greater impact than before. Wage inflation has an insignificant and positive impact on TEMP. But the method used to produce Table 19 does not take into consideration any correlation in the series. To encompass such shortcomings, we experiment with the use of the instrumental variables method with an option to correct for serial correlation. The results are shown in Table 20.

Table 20: Estimated effect of an increase in FLS, WI and MW on teenage employment, instrumental variable - GLS.

\[
\text{TEMP} = 1.29 - 0.025908\text{MW} - 1.39\text{PRIHEUR} - 0.466\text{SY} + 0.0754\text{AFP} - \\
(0.397) (4.319) (2.69) (0.153)
\]

\[
0.345\text{POP} - 0.632\text{EFTPP} - 0.00228\text{T} + 0.000026\text{TSQ} - 0.0377\text{Q2} + \\
(0.239) (3.68) (7.41) (2.49) (9.27)
\]

\[
0.104\text{Q3} + 0.0168\text{Q4} - 0.6415\text{FPP} + 0.0489\text{FPP} + \\
(20.88) (3.77) (1.34) (0.571)
\]

\[
\text{DW} = 1.982
\]
With the correction for serial correlation, we note some important changes as under the 2 SLS - GLS case.

As a matter of fact, the three policy variables behave almost the same way as under the 2 SLS - GLS. The minimum wage increase has little impact on teenage employment, although it maintains its adverse effect. Wage-inflation again has a negligible impact on TEMP and is insignificant.

The female labor supply, on the other hand, is statistically significant and has a larger negative impact on teenage employment. This supports our comments that an increase in FLS affects teenage employment much more heavily than the minimum wage.

As a last test of the consistency and robust quality of the results, other experiments were undertaken using different functional forms, namely logarithmic functional forms. The elasticities obtained reflect the tendency observed earlier. Female labor supply increases seem to affect the youth employment more adversely than increases in the minimum wage. The two negative effects of increases in the FLS and in the MW outweigh the small positive impact of wage-inflation in such a way that teenage employment declines overall.

We summarize in Table 21, the results of all the different experiments in elasticities.
Table 21: Coefficients of elasticity: estimated impact of a 10 percent increase in female labor supply, wage-inflation and minimum wage on teenage employment; Summary Table.

<table>
<thead>
<tr>
<th>Specifications and/or Functional Forms</th>
<th>Effect of MW</th>
<th>Effect of FLS</th>
<th>Effect of WI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Basic - OLS</td>
<td>-1.025</td>
<td>NI*</td>
<td>NI*</td>
</tr>
<tr>
<td></td>
<td>(3.08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - Basic - GLS</td>
<td>-0.454</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - Basic - log OLS</td>
<td>-1.060</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>(3.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 - Basic - log GLS</td>
<td>-0.884</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>(1.918)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - Extended Basic - OLS</td>
<td>-0.915</td>
<td>-26.77</td>
<td>+0.022</td>
</tr>
<tr>
<td></td>
<td>(3.007)</td>
<td>(4.20)</td>
<td>(0.542)</td>
</tr>
<tr>
<td>6 - Extended Basic - GLS</td>
<td>-0.204</td>
<td>-21.87</td>
<td>+0.0309</td>
</tr>
<tr>
<td></td>
<td>(0.456)</td>
<td>(3.46)</td>
<td>(0.121)</td>
</tr>
<tr>
<td>7 - Extended Basic Log OLS</td>
<td>-1.06</td>
<td>-39.15</td>
<td>+0.427</td>
</tr>
<tr>
<td></td>
<td>(3.90)</td>
<td>(6.50)</td>
<td>(4.17)</td>
</tr>
<tr>
<td>8 - Extended Basic Log GLS</td>
<td>-0.86</td>
<td>-25.67</td>
<td>+0.54</td>
</tr>
<tr>
<td></td>
<td>(2.19)</td>
<td>(3.75)</td>
<td>(7.11)</td>
</tr>
<tr>
<td>9 - 2SLS Extended Basic with first stage OLS</td>
<td>-0.671</td>
<td>-18.12</td>
<td>+0.098</td>
</tr>
<tr>
<td></td>
<td>(2.15)</td>
<td>(3.167)</td>
<td>(3.03)</td>
</tr>
<tr>
<td>10 - 2SLS Extended Basic GLS</td>
<td>-0.349</td>
<td>-26.83</td>
<td>+0.0608</td>
</tr>
<tr>
<td></td>
<td>(.776)</td>
<td>(4.05)</td>
<td>(0.44)</td>
</tr>
<tr>
<td>11 - 2SLS Extended Basic Logarithmic</td>
<td>-0.46</td>
<td>-28.94</td>
<td>0.908</td>
</tr>
<tr>
<td></td>
<td>(1.39)</td>
<td>(3.72)</td>
<td>(2.42)</td>
</tr>
<tr>
<td>12 - 2SLS Extended Basic GLS Logarithmic</td>
<td>-0.349</td>
<td>-26.83</td>
<td>+0.0608</td>
</tr>
<tr>
<td></td>
<td>(.776)</td>
<td>(4.05)</td>
<td>(0.44)</td>
</tr>
<tr>
<td>13 - Instrumental Variables Extended Basic</td>
<td>-0.827</td>
<td>-48.71</td>
<td>+0.0692</td>
</tr>
<tr>
<td></td>
<td>(2.478)</td>
<td>(14.044)</td>
<td>(0.371)</td>
</tr>
</tbody>
</table>
A scrutiny of the coefficients displayed in Table 21 reveals some interesting facts. To make those facts easy to understand, the regression coefficients have been converted into elasticities.

The rows in Table 19 differ in the control variables as well as in the functional forms.

Columns (2) (3) and (4) represent the three policy variables under investigation. Lines 1 through 4 report the estimates from the Basic Model. The Basic Model includes the policy variable minimum wage index. In addition, it controls for the season of the year (quarters: Q2, Q3, Q4 with the first quarter Q1 being the base). A time trend and a quadratic time trend are also incorporated in the Basic Model; likewise cyclical factors such as the prime age adult employment rate (PRIMEUR) and other supply side variables (SY, AFP, EFTPP and POP) are present.

The coefficients of elasticity in line 1 through 4 are identical to the ones in Table 11 (p. 60). Therefore, we will not dwell any further on their meanings; a 10 percent increase in the minimum wage leads roughly to a one percent reduction in teenage employment. Lines 5 through 8 report the estimates of the Basic Model extended to include the other two policy variables: the female labor supply (FLS) and wage-inflation (WI).

<table>
<thead>
<tr>
<th>14 - Instrumental Variables</th>
<th>(-0.186)</th>
<th>(-12.87)</th>
<th>(0.0172)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended GLS</td>
<td>((0.397))</td>
<td>((1.34))</td>
<td>((0.571))</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15 - Instrumental Variables</th>
<th>(-0.759)</th>
<th>(-27.2)</th>
<th>(0.0010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended Basic</td>
<td>((1.80))</td>
<td>((2.38))</td>
<td>((0.103))</td>
</tr>
</tbody>
</table>

NI* = Non included.
An analysis of the estimated coefficients of elasticity of the extended Basic Model prompts several comments.

1 - The OLS-GLS sensitivity persists, with the elasticities obtained under GLS smaller than the ones obtained under OLS. Moreover, the OLS-GLS gap persists under the linear as well as the logarithmic form.

2 - Perhaps the most striking finding is the fact that the female labor supply has a great negative impact on youth employment. A 10 percent increase in the FLS yields a decrease between 21.87 percent and 26.77 percent in the teenage employment as shown in Column (3). Furthermore, such a strong adverse effect is consistently statistically significant (3.46 ≤ t-value ≤ 6.50). This impact and significance are valid under the linear and logarithmic forms.

One may note also that the GLS coefficients are smaller than the OLS.

3 - The elasticities in Column (4) show the impact of a 10 percent increase in the wage-inflation on youth employment. An increase in the wage-inflation has consistently a positive and insignificant effect on teenage employment. A 10 percent increase in the WI leads from 0.022 percent to 0.54 percent increase in the teenage employment level. The logarithmic form seems to have a slightly greater elasticity though it is still insignificant.

4 - The minimum wage index continues to have its adverse effect on TEMP. However, there appears some ambiguity about its statistical significance. While the OLS estimates (linear and logarithmic) are
significant and of great impact, the GLS (linear and logarithmic) estimates are insignificant and of smaller magnitude. Overall, a 10 percent increase in the minimum wage decreases the teenage employment by 0.20 to 0.86 percent.

Based on the extended GLS results, one might conclude that the adverse impact of the female labor supply is about 20 times as strong as the negative effect of the minimum wage.

To further test the robustness of the above findings, we analyze the elasticity obtained using a joint estimation technique. Lines 9 through 12 display the 2SLS estimation elasticities, in linear and logarithmic form.

In either form, the MW negative impact is insignificant.

The female labor supply on the other hand continues to have an important adverse effect on the dependent variable. Indeed, teenage employment will be reduced from about 18.12 percent to 28.94 percent as a result of a 10 percent increase in the female labor supply; such a decline has statistical significance as opposed to the MW effect.

One observes also that wage-inflation has a negligible but positive effect on teenage employment.

Contrary to all previous estimations of the extended basic model, the wage-inflation impact becomes significant under the 2SLS logarithmic (t-value = 2.42).

For the joint estimation as a whole, using the 2SLS method, the findings seem to move in accordance with the single equation estimates of the extended basic model.
Except for the wage-inflation which is significant under the 2SLS logarithmic, the minimum wage index has small negative impact on TEMP, with more or less statistical significance. The female labor supply has a consistently greater and statistically significant adverse effect upon TEMP.

Finally, we conduct an additional experiment of the joint estimation to gauge the sensitivity of the results to the techniques of estimation.

Lines 13 to 15 report the elasticity coefficients when the instrumental variables techniques (hereafter INST) is used. Here again, one observes the preceding patterns of the effect of each policy variable.

The MW has mixed impact. A 10 percent increase in the MW would yield from 0.18 percent to 0.82 percent decline in TEMP. Such an impact is significant under INST without the serial correlation correction; but becomes insignificant when the serial correlation is removed.

Most of all, the female labor supply persists in its considerable negative impact on TEMP. TEMP will decrease from 12.87 percent to 48.71 percent following an increase of 10 percent in FLS. Such an impact is very significant.

Wage inflation has a very negligible effect, consistently positive but insignificant.
Summary of Part 1

In the previous analysis, one notes the ambiguity of the impact of the MW on TEMP as far as the statistical significance is concerned. Such ambiguity is predicted by theory.

Although the MW has a negative impact in the single equation analysis, such an impact is not consistently significant in the extended basic model and in the following joint estimation, the MW impact all but vanishes.

Wage inflation also demonstrates some statistical inconsistency in its negligible but positive impact on TEMP and no sound conclusion can be drawn.

The most consistent impact has been the one of the female labor supply variable. Through various forms and estimation techniques, the FLS maintains a considerable negative and significant impact on TEMP.

Based on such findings one might conclude that the female labor supply does unambiguously have an adverse effect on teenage employment.\textsuperscript{12}
Part II: Unemployment rate equation.

In Part I, we have examined the impact of increases in the minimum wage, female labor supply and wage-inflation on teenage employment.

In this second part, we follow the same scheme of analysis, only the teenage unemployment rate is used as the dependent variable.

Section 1: Replication of Brown et al. Basic Unemployment Rate Equation

The unemployment equation is described as follows:

\[ \text{TNUR} = e_0 + e_1 \text{MW} + e_2 \text{PRIMEUR} + e_3 \text{SY} + e_4 \text{AFP} + e_5 \text{FYP} + e_6 \text{POP} + e_7 T + e_8 \text{TSQ} + e_9 Q_2 + e_{10} Q_3 + e_{11} Q_4 + \epsilon. \]

We furnish considerable details in Part I. Here we present more concisely the major results. This includes results of the different functional forms (linear and logarithmic) and method of estimation (OLS and GLS).

Because no notable changes in the outcome arise from the different specifications in Part I, we will focus on the basic equation in this second part. The tables below display some selected regression results, followed by a succinct explanatory comment.
### Table 22: Estimated effect of an increase in the minimum wage on the teenage unemployment rate: Basic OLS linear.

\[
\begin{align*}
\text{TNUR} &= -0.186 - 0.00522340\text{MW} + 1.65\text{PRIMEUR} + 0.345\text{SY} + 0.0405\text{AFP} + 0.5704\text{POP} - 0.158\text{EFTPP} + 0.0076\text{Q}_3 + 0.0041\text{Q}_4 \\
&\quad (0.125) \quad (13.11) \quad (3.92) \quad (0.148) \\
&\quad (1.05) \quad (0.615) \quad (1.76) \quad (0.87) \quad (8.61) \\
R^2 &= 0.856 \quad F(11; 92) = 49.99 \\
R^2 &= 0.832 \quad DW = 2.03
\end{align*}
\]

### Table 23: Estimated effect of an increase in the minimum wage on the teenage unemployment rate: Basic GLS linear.

\[
\begin{align*}
\text{TNUR} &= -0.166 - 0.00952489\text{MW} + 1.64\text{PRIMEUR} + 0.336\text{SY} + 0.0039\text{AFP} + 0.36\text{POP} - 0.192\text{EFTPP} + 0.0044\text{Q}_4 \\
&\quad (0.234) \quad (13.31) \quad (3.93) \quad (0.015) \\
&\quad (0.85) \quad (0.75) \quad (2.203) \quad (1.29) \quad (8.71) \\
R^2 &= 0.865 \quad F(11; 91) = 51.34 \\
R^2 &= 0.848 \quad DW = 1.99 \\
RHO &= -0.028 \\
t(RHO) &= -0.293
\end{align*}
\]
Table 24: Estimated impact of an increase in the minimum wage on the teenage unemployment rate: Basic OLS logarithmic.

| \( \ln \text{TUR} \) | \( \ln \text{MW} \) | \( \ln \text{PRIMEUR} \) | \( \ln \text{POP} \) | \( \text{SY} \) | \( \text{AFP} \) | \( \text{EFTPP} \) | \( \text{T50} \) | \( \text{O2} \) | \( \text{O4} \) | \( \text{O3} \) | \( \text{O4} \) | \( \text{T} \) | \( \text{O3} \) | \( \text{T} \) | \( \text{O4} \) | \( \text{T} \) |
|-------------------|----------------|----------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| \( \beta \)       | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) |
| 0.61              | 0.03441        | 0.09691        | 0.521           | 2.023   | 0.0399 | 0.0344 | 0.121  | 0.0481 | 0.0211 | 1.013  | 0.02969 | 0.3951  | 0.341   | 1.929   | 0.379  | 1.354   | 0.000028 |
| (0.45)            | (13.83)        | (1.43)         | (3.57)          |         | (0.35) | (1.66) | (1.17) | (1.97) | (0.92)  |         | (0.44)  | (15.52) | (1.04)  |         | (3.88) | (0.225) | (2.43)  | (1.85)  |
| \( R^2 = 0.87 \)  | \( F(11; 92) = 56.36 \) |
| \( R^2 = 0.85 \)  | \( DW = 2.16 \) |

Table 25: Estimated impact of an increase in the minimum wage on the teenage unemployment rate: Basic GLS logarithmic.

| \( \ln \text{TUR} \) | \( \ln \text{MW} \) | \( \ln \text{PRIMEUR} \) | \( \ln \text{POP} \) | \( \text{SY} \) | \( \text{AFP} \) | \( \text{EFTPP} \) | \( \text{T50} \) | \( \text{O2} \) | \( \text{O4} \) | \( \text{O3} \) | \( \text{O4} \) | \( \text{T} \) | \( \text{O3} \) | \( \text{T} \) | \( \text{O4} \) | \( \text{T} \) |
|-------------------|----------------|----------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| \( \beta \)       | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) | \( SE(\beta) \) | \( t(\beta) \) |
| -1.053            | 0.02969        | 0.3951         | 0.341          | 0.441  | 1.929  | 0.379  | 1.354  | 0.000028|
| (0.44)            | (15.52)        | (1.04)         |             |         | (3.88) | (0.225)| (2.43) | (1.85)  |
| \( R^2 = 0.897 \) | \( F(11; 91) = 69.95 \) |
| \( R^2 = 0.884 \) | \( DW = 2.08 \) |
| \( RHO = -0.124 \) | \( \text{t}(RHO) = -1.278 \) |

The results put forth in Tables 22 through 25 exhibit two salient facts. First, the impact of an increase in the minimum wage on teenage unemployment rate is statistically insignificant; the t-value is equal to 0.125 on average. Second, the regression coefficient of the minimum wage reflects an unexpected negative sign when the linear
form is utilized under both OLS and GLS. On the other hand, the logarithmic form provides the expected positive effect of an increase in the minimum wage on the teenage unemployment rate. Yet no meaningful interpretation can be made if one relies on the logarithmic form. This is due to the lack of precision observed in the estimated impact as reflected in the very low t-statistics. Additional regression results of the basic teenage unemployment equation are presented in Appendix E. To test how sound are the above estimates, we take up the investigation of the effect of changes in the minimum wage on the teenage unemployment rate in the presence of female labor supply and wage-inflation.

Section 2: Extension of the Basic Unemployment Equation
Inclusion of the Female Labor Supply and Wage-inflation

As we did in Section 1, we present selected regression results of the extended basic model, in a series of tables. Following these tables, we summarize the most salient features in an explanatory comment.

Table 26: Effect of an increase in the MW on teenage unemployment in the presence of female labor supply and wage-inflation: extended model OLS linear.

\[
\text{TNR} = 0.43 + 0.00128618\text{MW} + 1.17\text{PRIMEUR} + 0.375\text{SY} - 0.149\text{AFP} - 0.375\text{SY} + 1.17\text{PRIMEUR} - 0.375\text{SY} - 0.149\text{AFP} - 0.271\text{POP} - 0.220\text{EFTPP} + 0.00116T - 0.0000631\text{SD} + 0.0243\text{Q}_2 + 0.00128\text{Q}_3 - 0.00161\text{Q}_4 - 0.6194\text{BLS} + 0.00169\text{WI} \\
(0.31) \quad (4.244) \quad (4.247) \quad (0.521) \\
(0.855) \quad (2.30) \quad (1.66) \quad (5.56) \\
(0.256) \quad (0.347) \quad (1.99) \quad (0.0133) \\
R^2 = 0.862 \quad F(13; 90) = 43.52 \\
\bar{R}^2 = 0.842 \quad DW = 2.051
\]
Table 27: Estimated effect of an increase in the MW on teenage unemployment rate in the presence of female labor supply and wage-inflation: GLS linear.

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUR</td>
<td>0.36</td>
<td>0.00214652</td>
<td>1.22</td>
</tr>
<tr>
<td>PRIMEUR</td>
<td>0.36354</td>
<td>0.533</td>
<td>0.44</td>
</tr>
<tr>
<td>aFP</td>
<td>0.158</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>POP</td>
<td>0.304</td>
<td>0.0000702</td>
<td>5.77</td>
</tr>
<tr>
<td>TPP</td>
<td>0.016</td>
<td>0.00000007</td>
<td>1.13</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.36354</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>AFP</td>
<td>0.158</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>POP</td>
<td>0.304</td>
<td>0.0000702</td>
<td>5.77</td>
</tr>
<tr>
<td>TPP</td>
<td>0.016</td>
<td>0.00000007</td>
<td>1.13</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.36354</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>NUR</td>
<td>0.36</td>
<td>0.00214652</td>
<td>1.22</td>
</tr>
<tr>
<td>PRIMEUR</td>
<td>0.36354</td>
<td>0.533</td>
<td>0.44</td>
</tr>
<tr>
<td>aFP</td>
<td>0.158</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>POP</td>
<td>0.304</td>
<td>0.0000702</td>
<td>5.77</td>
</tr>
<tr>
<td>TPP</td>
<td>0.016</td>
<td>0.00000007</td>
<td>1.13</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.36354</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>NUR</td>
<td>0.36</td>
<td>0.00214652</td>
<td>1.22</td>
</tr>
<tr>
<td>PRIMEUR</td>
<td>0.36354</td>
<td>0.533</td>
<td>0.44</td>
</tr>
<tr>
<td>aFP</td>
<td>0.158</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
<tr>
<td>POP</td>
<td>0.304</td>
<td>0.0000702</td>
<td>5.77</td>
</tr>
<tr>
<td>TPP</td>
<td>0.016</td>
<td>0.00000007</td>
<td>1.13</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.36354</td>
<td>0.0013</td>
<td>0.254</td>
</tr>
</tbody>
</table>

$R^2 = 0.871$  $F(13; 90) = 325.66$  $RHO = 0.04$

$R^2 = 0.852$  $DW = 1.98$  $t(RHO) = 0.412$

Table 28: Estimated effect of an increase in the MW, FLS and WI on teenage unemployment rate: OLS logarithmic.

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>InNUR</td>
<td>-1.28</td>
<td>0.03460441</td>
<td>5.77</td>
</tr>
<tr>
<td>PRIMEUR</td>
<td>0.368</td>
<td>0.367</td>
<td>0.76</td>
</tr>
<tr>
<td>aFP</td>
<td>0.361</td>
<td>2.125</td>
<td>1.17</td>
</tr>
<tr>
<td>POP</td>
<td>0.319</td>
<td>0.319</td>
<td>1.17</td>
</tr>
<tr>
<td>TPP</td>
<td>0.037</td>
<td>0.037</td>
<td>1.17</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.361</td>
<td>2.125</td>
<td>1.17</td>
</tr>
<tr>
<td>aFP</td>
<td>0.361</td>
<td>2.125</td>
<td>1.17</td>
</tr>
<tr>
<td>POP</td>
<td>0.319</td>
<td>0.319</td>
<td>1.17</td>
</tr>
<tr>
<td>TPP</td>
<td>0.037</td>
<td>0.037</td>
<td>1.17</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.361</td>
<td>2.125</td>
<td>1.17</td>
</tr>
<tr>
<td>InNUR</td>
<td>-1.28</td>
<td>0.03460441</td>
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</tr>
<tr>
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<td>0.368</td>
<td>0.367</td>
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</tr>
<tr>
<td>aFP</td>
<td>0.361</td>
<td>2.125</td>
<td>1.17</td>
</tr>
<tr>
<td>POP</td>
<td>0.319</td>
<td>0.319</td>
<td>1.17</td>
</tr>
<tr>
<td>TPP</td>
<td>0.037</td>
<td>0.037</td>
<td>1.17</td>
</tr>
<tr>
<td>PRIH[UR]</td>
<td>0.361</td>
<td>2.125</td>
<td>1.17</td>
</tr>
</tbody>
</table>

$R^2 = 0.871$  $F(13; 90) = 46.86$

$R^2 = 0.852$  $DW = 2.16$
Table 29: Estimated effect of an increase in the MW, FLS and WI on teenage unemployment rate: GLS logarithmic.

$$\ln\text{TNUR} = -0.99 + 0.03026431\ln\text{MW} + 0.3991\ln\text{PRIHEUR} + 0.07896$$

$$-0.03026431\ln\text{POP} + 0.3691\ln\text{SI} + 0.29\ln\text{EFPP} + 0.07896\ln\text{TSO} + 0.20202$$

$$+ 0.0903\ln\text{INFLS} + 0.48113\ln\text{WI}$$

$$R^2 = 0.897 \quad F(13; 89) = 52.65$$

$$R^2 = 0.882 \quad DW = 2.08$$

$$\rho = -0.124 \quad t(\rho) = -1.276$$

Two major facts emerge from the results presented in Tables 26 through 29. First, as we found under the basic unemployment model, the extended model proved to have very small and insignificant regression coefficients for the MW variable. Second, though the female labor supply variable demonstrates statistically significant results, its point estimate reveals a negative rather than the anticipated positive effect. Wage-inflation provides almost no discernible impact on the teenage unemployment rate as shown in its very small coefficients and t-values.

As a whole, the extended model brings no substantive changes in the results relative to the basic model.
Section 3: A simultaneous equations analysis of the extended teenage unemployment model: Two-stage least squares and instrumental variables methods.

In this section, we present the joint estimation of the teenage unemployment rate equation, female labor supply equation and wage-inflation equation.

This estimation method will serve as a test of the robust quality of the estimates. We apply the 2 SLS and the instrumental variables methods.

To be consistent with sections 1 and 2, we display selected regression results in a series of related tables. Succeeding these tables is a summary of the major features of the results, put forth in an explanatory comment.

Table 30: Estimated impact of a joint increase in the MW, FLS and WI on teenage unemployment: 2 SLS.

\[
\begin{align*}
\text{TNUR} &= 0.80 + 0.023195\text{MW} + 1.12\text{PRIMEUR} + 0.245\text{SY} + 0.0979\text{AFI} - \\
&\quad (0.577) (2.81) (0.377) \\
0.0024\text{POP} - 0.483\text{FTPP} + 0.00937 - 0.000048\text{TSQ} + 0.02202 + \\
&\quad (0.0045) (1.89) (2.005) (1.47) (5.84) \\
0.004303 - 0.0003204 - 1.00241\text{FLS} - 0.550630\text{WI} \\
&\quad (1.16) (0.088) (3.78) (1.39) \\
R^2 &= 0.878 \\
F(13; 90) &= 49.81 \\
R^2 &= 0.860 \\
DW &= 1.91
\end{align*}
\]
Table 31: Estimated effect of a joint increase in the MW, FLS and WI on teenage unemployment - 2 SLS-GLS.

\[
\begin{align*}
\text{TNUR} &= 0.93 + 0.0180452\text{MW} + 1.057\text{PRIMEUR} + 0.239\text{SY} + 0.840\text{AFP} - \\
&\quad 0.326\text{POP} - 0.404\text{EFTPP} + 0.00127\text{Q}_2 - 0.0000073\text{TSQ} + 0.021702 + \\
&\quad (0.422) (6.65) (2.58) (0.304) \\
&\quad (1.61) (1.61) (2.34) (1.99) (5.82) \\
&\quad 0.003803 - 0.00029\text{Q}_4 - 1.11479\text{FLS} - 0.48809\text{WI} \\
&\quad (0.082) (4.01) (1.20) \\
R^2 &= 0.868 \quad F(13; 89) = 39.60 \\
R^2 &= 0.849 \quad DW = 1.98 \\
RHO &= 0.078 \quad t(RHO) = 0.802
\end{align*}
\]

Table 32: Estimated impact of an increase in the MW, FLS and WI on teenage unemployment: 2 SLS logarithmic.

\[
\begin{align*}
\ln\text{TNUR} &= 1.68 + 0.031163\ln\text{MW} + 0.329883\ln\text{PRIMEUR} + 0.317366\ln\text{POP} + \\
&\quad 0.564\text{AFP} - 1.527\text{EFTPP} + 1.919\text{SY} + 0.0065\text{SY} - 0.0000384\text{TSQ} + 0.1802 + \\
&\quad (0.406) (5.47) (0.788) \\
&\quad (0.84) (3.27) (1.77) (1.48) (7.16) \\
&\quad 0.04303 + 0.0127\text{Q}_4 - 2.69895\ln\text{FLS} - 1.051\text{Q}_2\text{WI} \\
&\quad (1.72) (0.51) (1.28) (0.38) \\
R^2 &= 0.873 \quad F(13; 90) = 47.68 \\
R^2 &= 0.854 \quad DW = 2.10
\end{align*}
\]
Table 33: Estimated impact of an increase in the MW, FLS and WI on teenage unemployment: 2 SLS logarithmic - GLS.

\[
\ln TNUR = -2.02 + 0.0231\ln MW + 0.3331\ln PRIMEUR + 0.1491\ln POP + 0.127AFP - (0.33) (5.99) (0.39) (0.0727)
\]

\[
2.18EFTPP + 1.82SY + 0.0088T - 0.000051TSQ + 0.187Q2 + 0.051Q3 + (1.22) (3.45) (2.55) (2.11) (7.48) (2.14)
\]

\[
0.01704 - 2.341561\ln FLS - 1.09439WI
\]

\[
R^2 = 0.895 \quad F(13; 89) = 51.56
\]

\[
R^2 = 0.880 \quad DW = 2.05
\]

\[
RHO = -0.10 \quad t(RHO) = 1.029
\]

The results of the joint estimation of the teenage unemployment equation, female labor supply and wage-inflation equations follow the patterns encountered in the single equation analysis of the extended basic unemployment model.

First, the MW impact proved to be statistically insignificant as noted in the extended basic unemployment model.

Second, the FLS variable shows a significant effect on teenage unemployment; but this impact has the wrong sign.

Third the wage-inflation displays a mixed effect. In the linear form (Tables 30 and 31) an increase in the WI leads to a decline in teenage unemployment. In addition, the observed impact appears to be significant.

However, in the logarithmic form, though still maintaining its adverse effect, the WI impact is no longer statistically significant.
Overall, the results of the joint estimation proved to be not sound and no meaningful conclusion can be drawn regarding the effect of an increase in the MW, FLS and WI on the teenage unemployment rate.

Yet, as a last effort to test the robust quality of the estimates, we carry on the joint estimation using the instrumental variables method. The results are presented in Appendix E.

A close scrutiny of the estimates obtained from the instrumental variables method reveals the same salient features observed in the 2 SLS method, and there is no need to dwell on these facts further.

As a summary of all the results of the teenage unemployment equation, we put forth a final table of all the coefficients converted into elasticities, in order to better assess the impact of changes in the policy variables on teenage unemployment rate.

Table 34: Estimated impact of a 10 percent increase in the minimum wage, female labor supply and wage inflation on teenage unemployment rate (in percent).

<table>
<thead>
<tr>
<th>Specifications and/or Functional Forms</th>
<th>Effect of MW</th>
<th>Effect of FLS</th>
<th>Effect of WI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Basic - OLS linear</td>
<td>-0.106 (0.12)</td>
<td>NI*</td>
<td>NI*</td>
</tr>
<tr>
<td>2 - Basic - GLS linear</td>
<td>-0.194 (0.23)</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>3 - Basic - OLS logarithmic</td>
<td>+0.344 (0.45)</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>4 - Basic - GLS logarithmic</td>
<td>+0.296 (0.44)</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>5 - Basic + Pcwel OLS linear</td>
<td>-0.915 (0.158)</td>
<td>NI</td>
<td>NI</td>
</tr>
</tbody>
</table>
To interpret Table 34, consider for instance line 4 which portrays a GLS estimate with a double logarithmic form. The 0.296 means that a 10 percent increase in the MW is expected to increase the teenage unemployment rate by 0.296 percentage point. Similarly, line 7 portrays the OLS logarithmic estimate of the extended model. A 10

<table>
<thead>
<tr>
<th>6</th>
<th>Basic + EDP</th>
<th>+0.45</th>
<th>NI</th>
<th>MI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS linear</td>
<td>(0.50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Extended Basic OLS</td>
<td>-0.026</td>
<td>-35.26</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>linear</td>
<td>(0.31)</td>
<td>(1.99)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>8</td>
<td>Extended Basic GLS</td>
<td>-0.043</td>
<td>-30.63</td>
<td>0.0206</td>
</tr>
<tr>
<td></td>
<td>linear</td>
<td>(0.053)</td>
<td>(1.73)</td>
<td>(0.16)</td>
</tr>
<tr>
<td>9</td>
<td>Extended Basic OLS</td>
<td>0.346</td>
<td>-9.49</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>logarithmic</td>
<td>(0.45)</td>
<td>(0.55)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>10</td>
<td>2SLS</td>
<td>0.47</td>
<td>-37.08</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>(0.57)</td>
<td>(3.79)</td>
<td>(1.39)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2SLS - GLS</td>
<td>0.369</td>
<td>-63.49</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>(0.42)</td>
<td>(4.01)</td>
<td>(1.20)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2SLS logarithmic</td>
<td>0.31</td>
<td>-26.98</td>
<td>-1.055</td>
</tr>
<tr>
<td></td>
<td>GLS logarithmic</td>
<td>(0.40)</td>
<td>(1.28)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>13</td>
<td>2SLS logarithmic - GLS</td>
<td>0.23</td>
<td>-23.41</td>
<td>-1.092</td>
</tr>
<tr>
<td></td>
<td>(0.33)</td>
<td>(1.22)</td>
<td>(0.42)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Instrumental Variables</td>
<td>0.073</td>
<td>-42.17</td>
<td>-0.133</td>
</tr>
<tr>
<td></td>
<td>Method</td>
<td>(0.085)</td>
<td>(1.32)</td>
<td>(0.285)</td>
</tr>
<tr>
<td>15</td>
<td>Instrumental Variables</td>
<td>-0.079</td>
<td>-28.95</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>Method - GLS</td>
<td>(0.96)</td>
<td>(1.29)</td>
<td>(0.68)</td>
</tr>
<tr>
<td>16</td>
<td>Instrumental Variables</td>
<td>0.35</td>
<td>11.98</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Method: logarithmic</td>
<td>(0.46)</td>
<td>(0.37)</td>
<td>(0.25)</td>
</tr>
<tr>
<td>17</td>
<td>Instrumental Variables</td>
<td>0.31</td>
<td>15.39</td>
<td>1.39</td>
</tr>
<tr>
<td></td>
<td>Method: GLS logarithmic</td>
<td>(0.46)</td>
<td>(0.76)</td>
<td>(0.83)</td>
</tr>
</tbody>
</table>

*Non included.
percent increase in the MW, FLS and WI is expected to increase teenage unemployment by 0.34; 9.49 and 0.16 percentage points respectively. But because of the lack of precision in those estimates as shown in the low t-values, one might interpret them with caution. The estimates of the policy variables derived from the joint estimation display the same equivocal impact; those estimates are either very small and insignificant (WI and MW) or significant and wrong signed (FLS).

As a whole, the extended model of teenage unemployment provides no substantial changes in the results relative to the basic teenage unemployment estimates.

The joint estimation conveys no new pieces of information to the single extended unemployment equation of teenagers. This might tempt one to question how appropriate it is to use the unemployment rate to assess the impact of changes in the policy variables on the labor market conditions of teenagers.

As an alternative measure of the labor market conditions, we carry on the analysis using the labor force participation as a dependent variable.
Part III: Labor Force Participation Rate Equation.

In this last part of the empirical investigation, we analyze the effect of the minimum wage on the teenage labor force participation rate (thereafter TLFP).

Defined as the ratio of the teenage civilian labor force to the teenage population, the TLFP offers the opportunity to test how increases in the MW, FLS and WI affect the participation of youths in the labor force.

Section 1: Replication of Brown et al. Basic Single Equation Model.

To begin our analysis, we examine the impact of the MW on TLFP in the basic model.

The basic equation is as follows:

\[
\text{TLFP} = d_0 + d_1 \text{MW} + d_2 \text{PRIMEUR} + d_3 \text{SY} + d_4 \text{AFP} + d_5 \text{EFTPP} + d_6 \text{PDP} + \\
+ d_7 I + d_8 \text{TSQ} + d_9 \text{P3} + d_{10} \text{P4} + d_{11} O + t
\]

Since we provided considerable details in Part I, we will present concisely the results of the basic equation. We will do so in different functional forms: OLS linear, GLS linear, OLS logarithmic and GLS logarithmic.

Similarly, because the different specifications presented in Part I did not bring any major changes in the regression coefficients, we will not undertake the estimation of the different specifications and will concentrate on the basic equation as we did in Part II.

The tables below present the empirical results and are followed by an explanatory comment.
### Table 35: Estimated impact of an increase in the MM on the TLFP: Basic OLS Linear

| TLFP = 0.73 - 0.167457MW - 0.554PRIMEUR - 0.445SY + 0.757AFP - (3.42) | (3.73) | (4.31) | (2.35) |
|------------------|---------|---------|---------|---------|
| 0.568POP + 0.117EFTPP - 0.00065T + 0.0000226TSQ + 0.0611Q2 + (0.89) | (0.38) | (1.15) | (5.60) | (15.19) |
| 0.121Q3 + 0.0219Q4 | (27.25) | (5.18) |
| R² = 0.961     | F(11: 92) = 210.53 |
| R² = 0.957     | DW = 0.842 |

### Table 36: Estimated impact of an increase in the MM on the TLFP: Basic GLS Linear

| TLFP = 0.723 - 0.162424MW - 0.432SY - 0.636PRIMEUR + 0.978AFP - (2.39) | (2.50) | (3.07) | (2.04) |
|------------------|---------|---------|---------|---------|
| 0.814POP - 0.325EFTPP - 0.000016T + 0.0000198TSQ + 0.61Q2 + (0.64) | (1.58) | (0.013) | (2.31) | (19.34) |
| 0.124Q3 + 0.0219Q4 | (31.32) | (6.18) |
| R² = 0.974     | F(11: 91) = 307.103 |
| R² = 0.971     | DW = 1.997 |
**Table 37: Estimated impact of an increase in the MW on teenage labor force participation - Basic OLS-logarithmic.**

\[
\ln TLFP = -1.17 - 0.10041 \ln MW - 0.191 \ln POP - 0.04631 \ln PRIMEUR - 0.995Y +
\begin{array}{cccc}
(3.10) & (1.21) & (3.77) & (4.10) \\
\end{array}
\]

\[
1.16 \mathrm{AFP} - 0.328 \mathrm{EFTPP} - 0.000343T + 0.000393TSQ + 0.129Q_2 +
\begin{array}{cccc}
(1.43) & (0.46) & (0.229) & (3.74) & (13.80) \\
\end{array}
\]

\[
0.244Q_3 + 0.048Q_4
\begin{array}{c}
(23.54) & (4.99) \\
\end{array}
\]

\[
R^2 = 0.947 \quad F(11: 92) = 151.46
\]

\[
\bar{R}^2 = 0.941 \quad DW = 0.943
\]

**Table 38: Estimated impact of an increase in the MW on the teenage labor participation; Basic model: GLS logarithmic.**

\[
\ln TLFP = -1.76 - 0.127588 \ln MW - 0.3571 \ln POP - 0.06371 \ln PRIMEUR -
\begin{array}{cccc}
(2.819) & (1.20) & (3.36) \\
\end{array}
\]

\[
1.002Y + 1.61 \mathrm{AFP} - 1.46 \mathrm{EFTPP} + 0.00266T + 0.000025TSQ + 0.126Q_2 +
\begin{array}{cccc}
(2.53) & (1.35) & (2.90) & (0.83) & (1.17) & (16.13) \\
\end{array}
\]

\[
0.246Q_3 + 0.045Q_4
\begin{array}{c}
(25.003) & (5.20) \\
\end{array}
\]

\[
R^2 = 0.962 \quad F(11: 91) = 202.74
\]

\[
\bar{R}^2 = 0.957 \quad DW = 1.99
\]

\[
RHO = 0.58 \quad t(RHO) = 7.34
\]

The results displayed in Table 34 through 37 above portray the effect of an increase in the MW on labor force participation of youths. In sharp contrast to the mixed reaction observed in the teenage unemployment equation, the regression coefficients unambiguously demonstrate that an increase in the MW leads to a decline in the labor
force participation of youths; that is a withdrawal from the labor force. Moreover, the observed withdrawal is statistically significant consistently (t-value = 3.42).

For instance, the result in Table 37 (GLS logarithmic) shows that a 10 percent increase in the MW is expected to yield a 1.27 percent withdrawal from the labor force by youths.

All of the above mentioned results concern only the basic equation. To assess the effect of a joint increase in FLS, WI and MW, we turn to the extended model.

Section 2: Extension of the Basic Teenage Labor Force Participation Equation: Inclusion of Female Labor Supply and Wage-Inflation

We repeat the schemes of analysis adapted earlier by presenting the results in Tables 38 through 41. The most salient features of those tables are summarized in an explanatory commentary.

Table 39: Extended basic model: estimated impact of an increase in the MW, FLS and WI on the teenage labor force participation rate. OLS linear.

| TLFP | = 2.60 - 0.151458MW - 2.02PRIMEUR - 0.358SY + 0.166AFP - 3.17POP - | (3.60) (7.18) (4.01) (0.57) (4.57) |
| 0.068BEFTPP + 0.000395T + 0.00001173TSQ + 0.0461Q2 + 0.103Q3 + | (0.26) (0.742) (2.99) (10.25) (20.14) |
| 0.00534Q4 - 1.87331FLS + 0.0969WI | (1.11) (5.85) (0.763) |
| R² = 0.973 F(13; 89) = 249.28 |
| R² = 0.969 DW = 0.98 |
Table 40: Extended basic model: estimated impact of an increase in the MW, FLS and WI on the teenage labor force participation rate: GLS linear.

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL5</td>
<td>-1.56</td>
<td>0.562</td>
<td>2.83</td>
</tr>
<tr>
<td>WI</td>
<td>-0.342</td>
<td>0.226</td>
<td>-1.51</td>
</tr>
<tr>
<td>MW</td>
<td>0.248</td>
<td>0.094</td>
<td>2.61</td>
</tr>
<tr>
<td>PRIMEUR</td>
<td>-0.093</td>
<td>0.052</td>
<td>-1.74</td>
</tr>
<tr>
<td>Y</td>
<td>-0.001</td>
<td>0.000</td>
<td>-0.34</td>
</tr>
<tr>
<td>EFTPP</td>
<td>0.051</td>
<td>0.048</td>
<td>1.07</td>
</tr>
<tr>
<td>POP</td>
<td>-1.57</td>
<td>0.828</td>
<td>-1.89</td>
</tr>
<tr>
<td>POP2</td>
<td>0.002</td>
<td>0.000</td>
<td>2.04</td>
</tr>
<tr>
<td>T</td>
<td>0.000</td>
<td>0.000</td>
<td>0.99</td>
</tr>
<tr>
<td>T^5</td>
<td>0.000</td>
<td>0.000</td>
<td>0.02</td>
</tr>
<tr>
<td>T^7</td>
<td>0.000</td>
<td>0.000</td>
<td>0.02</td>
</tr>
<tr>
<td>R^2</td>
<td>0.980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F(13; 88)</td>
<td>307.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DW</td>
<td>2.047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RHO</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t(RHO)</td>
<td>7.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 41: Estimated impact of an increase in the MW, FLS and WI on the teenage labor force participation rate: OLS logarithmic.

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnTLFP</td>
<td>-3.85</td>
<td>0.999</td>
<td>-3.86</td>
</tr>
<tr>
<td>lnMW</td>
<td>-0.116</td>
<td>0.139</td>
<td>-0.84</td>
</tr>
<tr>
<td>lnPRIMEUR</td>
<td>-0.171</td>
<td>0.180</td>
<td>-0.95</td>
</tr>
<tr>
<td>lnPOP</td>
<td>-0.794</td>
<td>0.794</td>
<td>-1.00</td>
</tr>
<tr>
<td>SY</td>
<td>-0.946</td>
<td>0.794</td>
<td>-1.19</td>
</tr>
<tr>
<td>EFTPP</td>
<td>0.002</td>
<td>0.002</td>
<td>1.25</td>
</tr>
<tr>
<td>POP2</td>
<td>0.000</td>
<td>0.000</td>
<td>0.97</td>
</tr>
<tr>
<td>T</td>
<td>0.000</td>
<td>0.000</td>
<td>0.02</td>
</tr>
<tr>
<td>T^5</td>
<td>0.000</td>
<td>0.000</td>
<td>0.02</td>
</tr>
<tr>
<td>T^7</td>
<td>0.000</td>
<td>0.000</td>
<td>0.02</td>
</tr>
<tr>
<td>R^2</td>
<td>0.968</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F(12; 90)</td>
<td>230.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DW</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R^2</td>
<td>0.964</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Three major observations emerge from the analysis of the extended model of the labor force participation rate of youths.

1- The \( MW \) index variable continues to demonstrate a significantly negative impact on teenage labor force participation.

2 - The female labor supply variable proved to have a negative impact on teenage labor force participation. Furthermore, the impact is significant and of greater magnitude than the impact derived from an increase in the \( MW \).

3 - The wage-inflation variable positively affects youth labor force participation; but its effect is insignificant.

For instance, in the OLS logarithmic estimation (Table 40), an increment in both the \( MW \) and FLS produces a significant withdrawal from the labor force participation of youths. A 10 percent increase in the \( MW \) leads to a 1.16 percent withdrawal from the labor force, whereas a 10 percent increase in FLS leads to about a 38 percent reduction in youth labor force participation.
All of the above results stem from the extended basic single equation model, where FLS and WI are taken as predetermined.

To include FLS and WI as endogeneous for reasons cited earlier, we take up the simultaneous equations analysis.

Section 3: A Simultaneous Equations Analysis of the Extended Teenage Labor Force Participation Model. Two Stage Least Squares and Instrumental Variables Methods

In this section are reported the results of the joint estimation of the TLFP equation. Following the results displayed in the tables below, we provide a concise explanatory comment.

Table 43: Estimated impact of an increase in the MW, FLS and WI on teenage labor force participation: 2 SLS method.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>T-statistic</th>
<th>Coefficient</th>
<th>T-statistic</th>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLFP = 2.17 - 0.110469MW - 1.12PRIMEUR - 0.4885Y + 0.515AFP - 0.198EFTPP - 1.44POP - 0.00067T + 0.0000162TSQ + 0.056Q2 + 0.121Q3 + 0.0209Q4 - 1.53688FLS + 1.19432WI</td>
<td>(2.65)</td>
<td>(6.01)</td>
<td>(5.41)</td>
<td>(1.91)</td>
<td>(0.748)</td>
</tr>
<tr>
<td>$R^2 = 0.974$</td>
<td>$F(13: 89) = 265.39$</td>
<td>$R^2 = 0.971$</td>
<td>$DW = 1.17$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 44: Estimated impact of a joint increase in the MW, FLS and WI on teenage labor force participation: 2 SLS-GLS method.

\[
\begin{align*}
\text{TLFP} &= 1.94 - 0.11091\text{MW} - 0.995\text{PRIMEUR} - 0.492\text{SY} + 0.615\text{AFP} - \\
&\quad (1.86) (4.36) (3.68) (1.56) \\
0.408\text{EFTPP} - 0.97\text{POP} - 0.000907\text{T} + 0.000019\text{TSQ} + 0.057\text{Q}_2 + \\
&\quad (1.93) (1.03) (0.96) (3.11) (15.25) \\
0.123\text{Q}_3 + 0.021\text{Q}_4 - 1.3125\text{FLS} + 0.7762\text{WI} \\
&\quad (32.03) (6.05) (3.70) (1.76) \\
\text{R}^2 &= 0.976 \\
\text{F}(13; 88) &= 254.61 \\
\text{DW} &= 1.86
\end{align*}
\]

Table 45: Estimated impact of a joint increase in the MW, FLS and WI on teenage labor force participation: 2 SLS-logarithmic.

\[
\begin{align*}
\ln\text{TLFP} &= -2.50 - 0.02819\ln\text{MW} - 0.102\ln\text{PRIMEUR} - 0.501\ln\text{POP} - 1.122\text{SY} + \\
&\quad (0.954) (6.433) (3.46) (5.31) \\
0.57\text{AFP} - 1.49\text{EFTPP} - 0.000946\text{T} + 0.000029\text{TSQ} + 0.11\text{Q}_2 + 0.246\text{Q}_3 + \\
&\quad (0.85) (2.35) (0.69) (3.09) (11.59) (27.99) \\
0.048\text{Q}_4 - 4.7362\text{FLS} + 1.9324\text{WI} \\
&\quad (5.68) (5.93) (2.005) \\
\text{R}^2 &= 0.965 \\
\text{F}(13; 89) &= 191.38 \\
\text{DW} &= 1.27
\end{align*}
\]

An analysis of the figures in Tables 43 through 45 leads to three major observations.

1. The estimated impact of an increase in the female labor supply is consistently statistically significant in the joint estimation, when the equations are either in linear or logarithmic form.
2 - The MW index on the other hand, conveys mixed information. The estimated impact on an increment in the MW proved to be significant in the 2 SLS when the equations are in the linear form, but becomes insignificant in the logarithmic form.

3 - The wage-inflation variable affects positively the teenage labor force participation; that is, an increment in wage is likely to entice teenagers to keep searching for jobs, rather than withdrawing from the labor force.

As a final test of how robust are the 2 SLS coefficients, we estimated the joint model by applying the instrumental variables method. The results derived from the instrumental variables method are displayed in Appendix G. These results do not differ substantially from those obtained in the 2 SLS estimation.

We summarize all of the results of the teenage labor force participation in Table 46. The regression coefficients have been converted into elasticities.

### Table 46: Estimated effect of a 10 percent increase in MW, FLS and WI on teenage labor force participation (in percent).

<table>
<thead>
<tr>
<th>Specifications and/or Functional Forms and Methods of Estimation</th>
<th>Effect of MW</th>
<th>Effect of FLS</th>
<th>Effect of WI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Basic - OLS linear</td>
<td>-1.025</td>
<td>NI*</td>
<td>NI*</td>
</tr>
<tr>
<td></td>
<td>(3.42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - Basic - GLS linear</td>
<td>-0.994</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>(2.39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - Basic: OLS logarithmic</td>
<td>-1.004</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>(3.10)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4b presents the estimated effect of a 10 percent increase in the minimum wage index, female labor supply and wage-inflation on the teenage labor force participation, that is those teenagers who are employed or looking for work.

A close examination of the elasticity coefficients reveals some outcomes of interests.

First, in lines 1 through 4 are the estimated effect of an increase in the MW on teenage labor force, when the estimation is carried out on the basic teenage labor force model.
It can be seen that a 10 percent increase in the MW produced about a one percent decline in the teenage labor force. These effects proved to be statistically significant.

Accordingly, one might state that increases in the MW cause a significant withdrawal of youths from the labor force. Furthermore, in line 1, a 10 percent increase in the MW gives rise to a 1.02 percent withdrawal from the labor force by youths. This coefficient of elasticity is identical to the one obtained when we estimated a 10 percent increase in the MW on teenage employment (Table 11, line 1; page 60).

Consequently, one might expect that in the basic model, the unemployment effect of a 10 percent increase in the MW would be zero, since the teenage labor force withdrawals and the teenage employment reductions are equally proportional. Indeed, the teenage unemployment rate, though not exactly equal to zero, is practically close to zero. Such a gap may stem from the fact that certain teenagers drop-out of the labor force out of discouragement. Those discouraged workers are no longer counted as unemployed, and are at the core of the imprecise nature of unemployment as an accurate descriptive measure of labor market conditions.

The second observation one can make from Table 45 emerges from an examination of lines 5 through 8, where the extended teenage labor force participation model is analyzed.

The MW index continues to show a significant withdrawal from the labor force; a 10 percent increase in the MW produces about 0.57
percent withdrawal from the labor force by youths; the impact is reduced compared with the basic model.

Female labor supply demonstrates a surprisingly strong impact on the youth labor force; we expected the negative sign, not the magnitude. A 10 percent increment in FLS gives rise to about a 28 percent withdrawal from the labor force. In addition, the FLS impact proved to be statistically significant.

In sharp contrast to the FLS impact, the wage-inflation variable exhibits a positive effect on the teenage labor force, although this effect proved to be insignificant.

The third observation that comes out of Table 45 is concerned with the analysis of the elasticity coefficients of the policy variables when the simultaneous equations estimation is applied, as shown in lines 9 through 14. The MW index maintains its adverse effect on teenage labor force; but its statistical significance is questionable. Indeed in line 11, one realizes that when the logarithmic form is used, the MW index effect is no longer significant statistically. Accordingly, one might state that the MW demonstrates some ambiguity in the significance of its negative impact on teenage labor force. More interesting, the above mentioned ambiguity seems to lend support to the ambiguous impact of the MW on teenage employment encountered in section 3 of part 1.

Another salient point we note is that in the 2 SLS, the wage-inflation impact proved to be significant, although such impact is still small in magnitude. This implies that an increase in the wage rate motivates teenagers to search for jobs.
Perhaps the most striking result is the consistently strong negative impact of an increase in FLS on the teenage labor force. A 10 percent increase in the FLS in the joint estimation produces about a 22 percent withdrawal of youths from the labor force. Although we found such an impact surprisingly strong, the direction of the effect was expected.

Indeed, most previous studies have found appreciable labor-force withdrawal in response to increases in the minimum wage index. Our findings therefore lend support to past studies.

However, our study sheds new light in that it includes the female labor supply and wage-inflation variables.

By incorporating the FLS and WI, we disclosed that the withdrawal generated by an increase in the MW might not be significant consistently, whereas the FLS demonstrates a stronger and consistent negative effect on the youth labor force.

In addition, it should be noted that in the light of the different functional forms experiments we conducted, along with the various estimation methods, we found our results quite robust.
CHAPTER IV: SUMMARY AND POLICY IMPLICATIONS

The main objective of this research is to shed new light on the controversy surrounding the impact of increases in the federal minimum wage on the labor market. Special attention is directed at the teenage labor force status, as concern about youth unemployment has grown and because the minimum wage is often blamed for such high youth unemployment. Both past studies (with the Brown et al. work as reference) and the findings of this present research are presented. We relate our results to previous ones. To be comparable with other studies, quarterly data were used.

Most previous studies confined themselves to examining the effect of changes in the minimum wage on teenage employment or unemployment rates. We analyzed the effect of increases in the mandatory wage not only on employment, but also on the unemployment rate and on the labor force participation rate, following the Brown et al. framework.

However, the most important feature of our study is that for the first time the analysis is extended to incorporate new explanatory variables, namely the female labor supply and wage-inflation.

Motivating this extension is the observed sharp increase in the labor force participation rate of women, which constitutes the most fundamental change in the labor market since World War II.

Such changes in the composition of the labor force must be part of any comprehensive analysis of the unemployment level of any segment
of the total labor force. Likewise, the continuous increases in the average hourly earnings must also be part of an evaluation of the impact of the mandatory wage on the labor market.

Nevertheless, no previous study has explicitly and systematically considered the impact of increases in the female labor supply and wage-inflation in the analysis of the youth unemployment issue. In that sense alone, our contribution is in suggesting a new and broader approach to better understand the factors that lie behind youth unemployment and/or withdrawal from the labor force.

First we introduced both female labor supply and wage-inflation as \textit{exogenous} variables. But it is well-known that both variables are determined themselves by relevant socio-economic factors. Consequently, we incorporate at a second stage both variables in the model as \textit{endogenous}, and a simultaneous equations procedure is then utilized to assess the impact of both variables on teenage employment. This estimation technique is applied to each definition of the labor force status.

The results show great sensitivity to the ordinary and generalized least squares techniques of estimation. But because of the presence of serial correlation, we put more weight on the generalized least squares results.

Most previous studies reported only the ordinary least squares estimates and found that a 10 percent increase in the minimum wage leads to a one to three percent reduction in teenage employment. We
found that a 10 percent increase in the minimum wage yields a zero to one percent reduction in teenage employment in the basic equation. This supports the Brown et al. findings. The lower numbers are obtained from the generalized least squares estimates and linear relationship between teenage employment and the minimum wage. The higher estimates are derived from the double-logarithmic equations.

But this negative impact seems significant only in some specification and/or functional forms. However, once the model is extended to include the female labor supply and wage-inflation variables, we note considerable changes in the outcome. The negative impact of the minimum wage all but vanishes and clearly is no longer statistically significant. In contrast, the female labor supply does exhibit a strong negative and significant effect on teenage employment.

The estimates imply that a 10 percent increase in the female labor supply leads to about a 28 percent decline in youth employment. This female labor supply effect proved to be robust with regard to the alternative functional forms and specifications utilized. On the other hand, wage-inflation shows a positive but insignificant effect on youth employment.

As discussed above, we also explored the behavior of the policy variables using simultaneous equations procedures. Once again, important changes appear in the outcome of the basic model. The minimum wage has a small and insignificant impact on teenage employment. Also, wage-inflation shows a positive insignificant effect.
Only the increases in the female labor supply demonstrate a consistent and significant negative impact on teenage employment. A 10 percent increase in the MW and the FLS produced 0.34 percent and 26.83 percent reduction in youth employment respectively. In contrast, a 10 percent increase in the wage inflation gives rise to about a 0.06 percent increase in teenage employment.

Similar results are obtained when the teenage labor force participation rate is used as dependent variable. Wage-inflation has a negligible and positive effect on teenage labor force participation.

Both the female labor supply variable and the minimum wage index are inversely related to the participation of youths in the labor force. Both exhibit a statistically significant inverse relationship to the labor force participation rate, though of different magnitude.

A 10 percent increase in the minimum wage index led to a reduction from 0.80 percent to 1.61 percent decline in the participation rate of youths; whereas a 10 percent increase in the female labor supply reduces teenage labor force participation rate by about 30 percent.

Like most past studies, we found sufficient withdrawal from the labor force of youths as a result of an increase in the minimum wage. Nevertheless our findings show that the withdrawal resulting from an increase in the female labor supply is of greater magnitude.
Previous studies accepted the surprisingly large withdrawal of teenagers from the labor force without any explanation other than the negative effect of the minimum wage. But when one notes that the influx of female workers into the labor force has grown from one third before World War II to its current level of 53 percent, one might state that the increase in the female labor supply is an underlying factor to take into consideration in assessing the determinants of the withdrawal of teenagers from the labor force.

This hypothesis does not necessarily indicate a causal relationship between teenage labor force participation rate and female labor supply. Rather, it is consistent with the strong negative correlation between these two groups of workers, which can explain "the extent to which women and youths are substitutes in production" as Hamermesh and Grant have observed.

The results are somewhat more difficult to interpret when one uses the teenage unemployment rate as a dependent variable. The estimated effect on the teenage unemployment rate of increases in the policy variables are either very small or wrong-signed.

Furthermore, those estimates exhibit great imprecision as shown in the very high standard errors in the basic equation. The extended model provides no substantive changes relative to the basic model.

The female labor supply variable proved to have the only significant result but its point estimate implies a negative rather than its expected positive effect.
The wage-inflation variable has almost no discernible impact under all the different experiments. Despite these shortcomings, as a whole, one might cautiously state that a 10 percent increase in the minimum wage would increase teenage unemployment rate by about one tenth of one percentage point.

In stark contrast to the small minimum wage impact, a 10 percent change in the female labor supply yields a nine to about thirty percentage point change in the teenage unemployment rate, but in the wrong direction.

Taken together, these results lend credence to the accepted notion that the employment rate and/or the labor force participation rate, are better descriptive measures of the conditions of the labor market than is the unemployment rate.

**Policy Implications**

The findings reported in this research appear to have important policy implications. Indeed, one of the most frequently suggested proposals to deal with the high teenage unemployment rate consists of a "subminimum" or "dual minimum" wage for teenagers.

The results of this study suggest that such a policy proposal, if applied in isolation, might not provide the expected remedy for the overall teenage unemployment.

Most important, our findings might put into doubt the adequacy of the subminimum wage proposal as a viable policy solution for high teenage unemployment.
On the one hand, our results have demonstrated that an increase in the female labor supply variable has consistently shown a strong and statistically significant negative impact on the teenage employment and on the teenage labor force participation.

On the other hand, the minimum wage has shown some ambiguity in its adverse effect on both teenage employment and on the teenage labor force, when the model is estimated using the simultaneous equations procedure. As for the wage-inflation variable, it has had a consistent positive impact but the impact has been so small that it is appropriate to state that it has proved not to have any meaningful effect on youth employment and labor force participation.

Therefore, given the incertitude surrounding the level of significance of the impact of increases in the minimum wage on youth employment and labor force, and given the consistency of the female labor supply's significant negative impact on youth employment and on labor force participation, one should consider the "youth differential" minimum wage proposal with caution.

Before we analyze the different aspects of the "dual minimum" wage proposal, we will explain what "subminimum" wage really means.

Conceptually, a "youth differential" minimum wage, its advocates believe, would reduce the wage employers could pay to youths. This will have the effect of making employment for the unskilled teenagers more feasible to employers who could pay youths a wage below the national minimum wage and still comply with the Fair Labor Standards Act of 1938 which established the national minimum wage.
Consequently, continue the proponents, the dual minimum would help reduce the persistently high teenage unemployment rate.

In its simplest form, the subminimum wage would allow employers to pay youths about 75 percent or 85 percent of the basic minimum wage.

In stark contrast, critics contend that such a dual minimum wage would be at the expense of older high-paid workers. The prospect of the possible substitution between teenagers and adults is at the heart of the controversy surrounding the dual minimum proposal.

Missing in this debate, however, is the factor capturing the most fundamental change that has occurred over time in the American labor market: the increase in the female labor supply. In fact, the tremendous influx of women into the labor force cannot be ignored if one is to conduct a comprehensive analysis of the employment conditions of one segment of the labor force. For the first time, we introduced the female labor supply explicitly into the analysis. Our results have clearly disclosed that an increase in the female labor supply variable does produce a greater decline in youth employment or withdrawal from the labor force than the MW. This lends credence to Hamermesh and Grant's (1981) findings that teenagers and women are close substitutes in low-skilled production activities.

Under these circumstances, a mere lowering of the minimum wage for one special group—teenagers—could not reduce substantially their unemployment rate.

Opponents often contend that the dual minimum would not generate additional jobs for youths. The reasons they failed to provide stem from the changing structure of the composition of the labor force.
Certainly a lower minimum wage would induce fast-food employers to hire a greater number of youths. But for the economy as a whole, not all the teenagers will be absorbed if the substitution between youths and women takes place. For example, the fast food chain Stake-n-Shake responded to the 1978 jump in the minimum wage by replacing teenagers with fewer older women workers who tend to be more productive, and easier to train and so create less turnover. Several factors have contributed to the increase in female labor supply. One of the most important is the lowering of the reservation wage of women. Indeed, prior to World War II, women had a high reservation wage, mainly because they valued their non-market time to perform traditional household work more than market time activities. Other factors include the changing nature of jobs (fewer heavy-duty manufacturing jobs and more service jobs), the increased opportunity of education for women, the development of child care services, and the changes in attitudes (acceptance of more single women, the emergence of the women's movement, the fight against sex discrimination in the work place). All of the above factors along with the insufficient income of husband, have decreased the value of non-market time for women and consequently lowered their reservation wage. This decline in the women's reservation wage relative to the minimum wage which did change upward, has prompted women to enter the labor force, thereby increasing the total labor pool of the economy.

Therefore, if the subminimum wage is to reduce youth unemployment as expected, it must be set so that it is below the women's
reservation wage. If this is done, it will encourage women to withdraw from the labor force. Teenagers may then fill in the openings created by these withdrawals. But at that level, the subminimum wage will be so low that only migrant workers without reservation wage, may be willing to accept to work.

It should be noted at this point that the withdrawal of women from the labor force should not be a deliberate policy option. Still, if the dual minimum wage is not below the women's reservation wage, women will continue to supply a great percentage of the labor force. Substitution between youths and women will occur and the "dual minimum" wage will become an impotent policy option.

Furthermore, Hamermesh and Grant showed that women proved to be preferred substitutes for teenagers by many employers. Such favorable treatment of women turned out to prevail even in some jobs where existing wages differentials are in force under section 14 of the Fair Labor Standards Act. This is the case for full-time students, learners not in retail or service industries, and handicapped workers in sheltered workshops, whom employers are authorized to pay less than the minimum wage. Should this preferential treatment be motivated by the practice of role prejudice of employers, then antidiscrimination policy measures might be necessary.

In addition, teenagers do not constitute a homogeneous group. Many studies have demonstrated that minority teenagers' unemployment is at least twice as high as their white counterparts. Hence, a subminimum wage alone cannot solve the high overall teenage
unemployment if it is indeed the outcome of labor market discrimination.

As a whole, we find that increases in youth employment do not translate into a one-for-one reduction in youth unemployment. This confirms previous studies. Beyond that point, our contribution resides in proposing a broader framework of analysis than the ones encountered in past research. We did so by incorporating the female labor supply into the analysis.

This inclusion raises questions about the adequacy of the dual minimum wage to curb the high teenage unemployment. Moreover, it provides some information concerning the factors that underlie the discrepancy between teenage employment increases and reductions in teenage unemployment.

At the outset, we favor a policy of an overall sustained economic growth that will enable the economy to absorb the increased labor force, rather than a policy option whose ultimate effect is to confront one segment of the labor force with another. In the tight labor market situation stemming from the overall economic expansion, the wage rate will be based on jobs, not on the characteristics of the people who hold these jobs.
End Notes of Chapter III

1 I am indebted to Professor C. Brown for making his data set available to us.

2 Citibase is made available to us by the Social Science Research Facilities (SSRF), Department of Economics of the University of Wisconsin-Milwaukee.

3 Data on years of school completed were obtained from the "Labor Force Statistics" derived from the CPS: A Data Book, Vol. 1, p. 7751. One should note that the question on educational attainment applies only to progress in "regular" schools. Such schools include graded public, private and parochial elementary and high schools, colleges, universities and professional schools, whether day school or night schools.

   The median years of school is defined as the value which divides the distribution into two equal groups; one having completed more schooling and one having completed less schooling than the median. These medians are expressed in terms of a continuous series of numbers representing years of school completed. For example, a median of 13.0 means completion of the first year of college.

4 I am grateful to Mr. Howard Hayghe of the U.S. Department of Labor, Bureau of Labor Statistics (BLS) for making the series available to our use.

5 The median income is the amount which divides the distribution of income into two equal groups: one having income above the median and the other having below the median.

   Data on husband's income were obtained from the U.S. Bureau of Census Publications titled "Current Population Reports, series P-80, Income of Households, Families and Persons."

6 The median incomes were published annually. To obtain quarterly data without losing the time trend, a spline functions technique was used. Professor J. W. Elliott provided us with the computer assistance available at the Massachusetts Institute of Technology.

7 Children are defined as own children and related children. "Own" children in a family are sons and daughters, including stepchildren and adopted children of the family head.

   "Related" children in a family include own children and all other children in the household who are related to the family head by blood, marriage or adoption.

   The data were obtained from natality statistics analysis in the United States 1917-1978 monthly vital statistics report. CPR series P-20, No. 336, April 1979. As in most studies, the proxy of total fertility rate was used.
Total fertility = sum of age specific fertility rates for single women, 14-49 years of age. This represents an estimate of the number of children born per woman over the child bearing period.

OLS: ordinary least squares.

GLS: generalized least squares correction of serial correlation of the error by the Cochrane-Orcutt Iterative Technique.

In logarithmic equations, TEMP, MW, PRIMEUR, POP and PCWEL are entered logarithmically; other variables linearly.

Using order-condition and Kmenta Rank Condition, we find out that the system was overidentified. This prompted us to use the two-stage least square instead of the indirect least square method.

Such ambiguity is supported by the multiple correlation coefficients presented in Appendix H.
APPENDICES
Appendix A: Basic Teenage Employment Equation. Regression Results.
OLS linear; Different Specification.

1 - BASIC - TSQ
TEMP = 1.096 - 0.13385BMW - 1.429PRIMEUR - 0.697SY + 0.5882EFTPP -
(2.56)   (9.101)   (6.59)   (1.92)
3.602POP + 0.023AFP + 0.00172T + 0.035Q2 + 0.96Q3 + 0.0142Q4
(10.3)   (0.073)   (6.87)   (8.22)   (20.5)   (3.16)
R² = 0.940   F(10; 93) = 146.138
R² = 0.933   DW = 0.84

2 - BASIC - SY
TEMP = 0.45 - 0.09968BMW - 1.267PRIMEUR - 0.627AFP + 0.361EFTPP -
(1.909)   (7.91)   (1.88)   (1.12)
0.261POP - 0.00172T + 0.0000267SQ + 0.037Q2 + 0.1005Q3 + 0.017Q4
(0.38)   (2.99)   (6.36)   (8.72)   (20.80)   (3.76)
R² = 0.938   F(10; 93) = 142.79
R² = 0.932   DW = 0.7015
3 - BASIC - AFP

\[ \text{TEMP} = 0.87 - 0.11316 \text{WW} - 1.36 \text{PRIMEUR} - 0.55 \text{SY} + 0.87 \text{EFTP} - 1.45 \text{POP} - (2.54) \quad (9.85) \quad (5.61) \quad (0.304) \quad (2.82) \]
\[ 0.000741 + 0.0000171 \text{TSQ} + 0.36 \text{Q}_2 + 0.99 \text{Q}_3 + 0.15 \text{Q}_4 \]
\[ (1.39) \quad (4.96) \quad (9.56) \quad (23.6) \quad (3.65) \]
\[ R^2 = 0.952 \quad F(10; 93) = 187.36 \]
\[ R^2 = 0.947 \quad DW = 0.786 \]

4 - BASIC - EFTP

\[ \text{TEMP} = 0.79 - 0.1411 \text{WW} - 1.323 \text{PRIMEUR} - 0.55 \text{SY} + 0.61 \text{AFP} - 0.783 \text{POP} - (3.10) \quad (9.61) \quad (5.85) \quad (2.05) \quad (1.34) \]
\[ 0.000941 + 0.0000209 \text{TSQ} + 0.037 \text{Q}_2 + 0.101 \text{Q}_3 + 0.015 \text{Q}_4 \]
\[ (1.80) \quad (5.89) \quad (9.93) \quad (25.5) \quad (4.03) \]
\[ R^2 = 0.954 \quad F(10; 93) = 196.07 \]
\[ R^2 = 0.949 \quad DW = 0.786 \]
BASIC - POP

\[
\text{TEMP} = 0.71 - 0.1430\text{MW} - 1.24\text{PRIMEUR} - 0.527\text{SY} + 0.827\text{AFP} + \\
(3.115) \quad (9.68) \quad (5.51) \quad (3.23)
\]

\[
0.0033\text{EFTPP} - 0.00155\text{T} + 0.000025\text{TSQ} + 0.038\text{Q}_2 + 0.102\text{Q}_3 + \\
(0.012) \quad (5.60) \quad (12.92) \quad (10.29) \quad (25.34)
\]

\[
0.016\text{Q}_4
\]

\(R^2 = 0.953 \quad F(10; 93) = 192.16\)

\(R^2 = 0.948 \quad DW = 0.766\)

---

BASIC + PCWEL

\[
\text{TEMP} = 0.89 - 0.1544\text{MW} - 1.699\text{PRIMEUR} - 0.567\text{SY} + 0.56\text{AFP} - 0.34\text{EFTPP} - \\
(3.89) \quad (12.33) \quad (6.78) \quad (2.15) \quad (1.33)
\]

\[
1.758\text{POP} - 0.000407\text{T} + 0.000014\text{TSQ} + 0.033\text{Q}_2 + 0.098\text{Q}_3 + \\
(3.23) \quad (0.86) \quad (4.21) \quad (10.23) \quad (27.06)
\]

\[
0.011\text{Q}_4 + 0.287\text{PCWEL}
\]

\(R^2 = 0.966 \quad F(12; 91) = 218.36\)

\(R^2 = 0.962 \quad DW = 1.047\)
### BASIC + EDP

\[
\text{TEMP} = 0.861 - 0.104\text{MM} - 1.38\text{PRIMEUR} - 0.45\text{SY} + 0.45\text{AFP} + 0.190\text{EFP} - \\
(2.10) (9.74) (4.26) (1.45) (0.66)
\]

\[
0.674\text{POP} - 0.00032T + 0.00015TSQ + 0.036Q_2 + 0.090Q_3 + \\
(1.13) (0.52) (3.23) (9.51) (23.2)
\]

\[
0.015Q_4 - 0.22\text{EBP} \\
(4.63) (1.78)
\]

\[
R^2 = 0.956 \quad F(12; 91) = 165.84
\]

\[
R^2 = 0.950 \quad DW = 0.84
\]
Appendix B: Teenage Employment Equation; Regression Results, GLS Linear. Different Specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Equation</th>
<th>R²</th>
<th>R² Adj</th>
<th>DW</th>
<th>t(RHO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - BASIC - TSO</td>
<td>( \text{EHP} = 0.924 - 0.0548 \text{HW} - 1.086 \text{PRIHEUR} - 0.548 \text{SY} - 0.056 \text{AFP} )</td>
<td>0.911</td>
<td>0.974</td>
<td>2.038</td>
<td>13.53</td>
</tr>
<tr>
<td>( 0.60 \text{EFTP} + 2.9 \text{POP} + 0.0017T + 0.04Q_2 + 0.10Q_3 + 0.02Q_4 )</td>
<td>(0.81) (5.29) (2.84) (0.113) (3.52) (4.5) (13.8) (29.7) (29.74) (6.19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - BASIC - SY</td>
<td>( \text{EHP} = 0.42 - 0.37 \text{HW} - 1.05 \text{PRIHEUR} + 0.34 \text{AFP} - 0.56 \text{EFTP} + 0.036 \text{POP} )</td>
<td>0.977</td>
<td>0.975</td>
<td>365.93</td>
<td>12.56</td>
</tr>
<tr>
<td>( 0.0019T + 0.000027 \text{TSQ} + 0.04Q_2 + 0.10Q_3 + 0.02Q_4 )</td>
<td>(0.55) (5.09) (0.68) (3.20) (0.021) (1.01) (2.17) (13.9) (29.49) (6.27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 - BASIC - AFP

\[ TEMP = 0.79 - 0.049MW - 1.14PRIMEUR - 0.49SY - 0.57EFTPP - 1.21POP - 0.78 (5.97) (2.83) (3.27) (1.01) \]

\[ 0.001T + 0.00001TSQ + 0.039Q2 + 0.107Q3 + 0.019Q4 \]

\[ (0.49) (1.89) (14.7) (30.49) (6.11) \]

\[ R^2 = 0.976 \]

\[ F(10; 92) = 371.49 \]

\[ R^2 = 0.973 \]

\[ DW = 1.92 \]

\[ \rho = 0.71 \]

\[ t(\rho) = 10.52 \]

4 - BASIC - EFTPP

\[ TEMP = 0.73 - 0.0712MW - 1.12PRIMEUR - 0.49SY + 0.50AFP - 0.59POP - 1.12 (5.83) (3.03) (1.13) (0.501) \]

\[ 0.001T + 0.0000204TSQ + 0.039Q2 + 0.104Q3 + 0.019Q4 \]

\[ (0.96) (2.50) (13.49) (29.20) (5.93) \]

\[ R^2 = 0.972 \]

\[ F(10; 92) = 318.13 \]

\[ R^2 = 0.969 \]

\[ DW = 1.91 \]

\[ \rho = 0.633 \]

\[ t(\rho) = 8.30 \]
5 - BASIC - POP

\[
\text{TEMP} = 0.68 - 0.06061\text{MW} - 1.09\text{PRIMEUR} - 0.49\text{SY} + 0.55\text{AFP} - 0.56\text{EFTPP} - 0.0076 + 0.00024\text{TSO} + 0.04\text{Q}_2 + 0.10\text{Q}_3 + 0.02\text{Q}_4 \\
\begin{array}{cccc}
(0.95) & (5.89) & (2.91) & (1.39) & (3.24)
\end{array}
\]

\[
(2.78) & (5.62) & (14.68) & (31.29) & (6.41)
\]

\[R^2 = 0.976 \quad F(10; 92) = 372.98\]

\[R^2 = 0.973 \quad DW = 1.92\]

\[RHO = 0.712\]

\[t(RHO) = 10.31\]

6 - BASIC + PCWEL

\[
\text{TEMP} = 0.82 - 0.0908\text{MW} - 1.36\text{PRIMEUR} - 0.54\text{SY} + 0.47\text{AFP} - 1.28\text{POP} - 0.58\text{EFTPP} - 0.0007\text{T} - 0.000016\text{TSO} + 0.037\text{Q}_2 + 0.104\text{Q}_3 + 0.15\text{Q}_4 + 0.2225\text{PCWEL} \\
\begin{array}{cccc}
(1.59) & (7.28) & (3.87) & (1.18) & (1.25)
\end{array}
\]

\[
(3.12) & (0.73) & (2.35) & (13.39) & (29.95)
\]

\[R^2 = 0.975 \quad F(12; 90) = 275.13\]

\[R^2 = 0.971 \quad DW = 1.86\]

\[RHO = 0.57\]

\[t(RHO) = 7.08\]
7 - BASIC + EDP

\[ \text{TEMP} = 0.79 - 0.0524 \text{MW} - 1.16 \text{PRIMEUR} - 0.42 \text{SY} + 0.39 \text{AFP} - 0.17 \text{POP} - \]
\[ (0.82) \quad (5.99) \quad (2.39) \quad (0.85) \quad (0.126) \]
\[ 0.51 \text{EFTPP} - 0.000491 \text{T} + 0.000016 \text{TSQ} + 0.009Q_2 + 0.106O_3 + \]
\[ (2.91) \quad (0.33) \quad (1.65) \quad (13.18) \quad (29.32) \]
\[ 0.019Q_4 - 0.14 \text{EDP} \]
\[ (6.18) \quad (1.69) \]

\[ R^2 = 0.977 \quad F(12; 90) = 299.42 \]

\[ R^2 = 0.974 \quad DW = 1.91 \]

\[ \text{RHO} = 0.71 \]

\[ t(\text{RHO}) = 10.23 \]
Appendix C: Teenage Employment Equation; Regression Results. OLS logarithmic. Different Specifications.

### 1 - BASIC - TSQ

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnTEMP</td>
<td>-2.95</td>
<td>0.105</td>
<td>2.79</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnMW</td>
<td>-0.105</td>
<td>0.007</td>
<td>-15.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnPRIMEUR</td>
<td>-0.126</td>
<td>0.010</td>
<td>-12.29</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnPOP</td>
<td>-0.861</td>
<td>0.106</td>
<td>-8.08</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SY2</td>
<td>-1.53</td>
<td>0.12</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnTSQ</td>
<td>0.60</td>
<td>0.15</td>
<td>4.44</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnAFP</td>
<td>0.64</td>
<td>0.09</td>
<td>7.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnEFTPP</td>
<td>0.0045</td>
<td>0.003</td>
<td>1.64</td>
<td>0.10</td>
</tr>
<tr>
<td>lnQ2</td>
<td>-0.22</td>
<td>0.08</td>
<td>-2.67</td>
<td>0.008</td>
</tr>
<tr>
<td>lnQ3</td>
<td>0.04</td>
<td>0.008</td>
<td>4.79</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnQ4</td>
<td>0.23</td>
<td>0.08</td>
<td>2.96</td>
<td>0.003</td>
</tr>
</tbody>
</table>

R² = 0.939  \( F(10; 93) = 143.49 \)  
R² = 0.932  \( DW = 0.92 \)

### 2 - BASIC - SY

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnTEMP</td>
<td>-2.13</td>
<td>0.074</td>
<td>-2.88</td>
<td>0.005</td>
</tr>
<tr>
<td>lnMW</td>
<td>-0.0194</td>
<td>0.006</td>
<td>-3.41</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnPRIMEUR</td>
<td>-0.11</td>
<td>0.010</td>
<td>-11.33</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnPOP</td>
<td>-0.25</td>
<td>0.022</td>
<td>-11.32</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SY2</td>
<td>0.25</td>
<td>0.03</td>
<td>8.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnAMP</td>
<td>0.60</td>
<td>0.08</td>
<td>6.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnEFTPP</td>
<td>0.0027</td>
<td>0.0001</td>
<td>36.66</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnQ2</td>
<td>0.09</td>
<td>0.01</td>
<td>9.02</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnQ3</td>
<td>0.23</td>
<td>0.04</td>
<td>5.59</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>lnQ4</td>
<td>0.04</td>
<td>0.01</td>
<td>3.98</td>
<td>0.001</td>
</tr>
</tbody>
</table>

R² = 0.931  \( F(10; 93) = 125.84 \)  
R² = 0.923  \( DW = 0.99 \)
### 3 - BASIC - AFP

\[
\ln \text{TEMP} = -1.86 - 0.09651 \ln \text{MW} - 0.1201 \ln \text{PRIMEUR} - 0.411 \ln \text{POP} - 1.30 \text{SY} - (3.14) \quad (9.99) \quad (3.27) \quad (5.36)
\]

\[
0.112 \text{EFTP} + 0.00061 + 0.000037 \text{T SQ} + 0.093 \text{Q}_2 + 0.23 \text{Q}_3 + 0.044 \text{Q}_4
\]

\[
(0.15) \quad (0.41) \quad (3.86) \quad (9.97) \quad (22.5) \quad (4.4)
\]

\[
R^2 = 0.947 \quad \quad \quad F(10; 93) = 166.97
\]

\[
R^2 = 0.941 \quad \quad \quad DW = 0.903
\]

### 4 - BASIC - EFTP P

\[
\ln \text{TEMP} = 1.71 - 0.10591 \ln \text{MW} - 0.1171 \ln \text{PRIMEUR} - 0.331 \ln \text{POP} - 0.35 \text{SY} + (3.26) \quad (5.97) \quad (2.13) \quad (5.47)
\]

\[
0.706 \text{AFP} + 0.00091 + 0.00004 \text{T SQ} + 0.09 \text{Q}_2 + 0.23 \text{Q}_3 + 0.044 \text{Q}_4
\]

\[
(0.86) \quad (0.61) \quad (4.003) \quad (10.04) \quad (23.58) \quad (4.50)
\]

\[
R^2 = 0.947 \quad \quad \quad F(10; 93) = 220.17
\]

\[
R^2 = 0.942 \quad \quad \quad DW = 0.92
\]
5 - BASIC - lnPOP: lnTEMP = -0.88 - 0.11261lnMW - 0.1071lnPRIMEUR - (3.40) (9.30)

1.265Y + 1.74AFP - 0.29EFP + 0.0036T + 0.00006TSQ + 0.09802 + (3.52) (2.61) (0.409) (4.68) (11.48) (10.40)

0.2403 + 0.04704
(23.38) (4.84)

R² = 0.945  F(10; 93)

R² = 0.939  DW = 0.843

6 - BASIC + lnPCWEL: lnTEMP = -1.81 - 0.15991lnMW - 0.1491lnPRIMEUR - (5.95) (13.98)

0.441lnPOP - 1.28SY + 1.40AFP - 1.70EFP + 0.002T + 0.00004TSQ + (3.52) (6.66) (2.13) (2.83) (1.87) (5.24)

0.087Q² + 0.23Q³ + 0.034Q₄ + 0.10221PCWEL
(11.57) (28.24) (4.38) (7.45)

R² = 0.967  F(12; 91) = 225.89

R² = 0.963  DW = 1.33

7 - BASIC + EDP: lnTEMP = -1.34 - 0.08251lnMW - 0.131lnPRIMEUR - (2.50) (10.09)

0.303lnPOP - 0.98SY + 0.093AFP + 0.305EFP + 0.0013T + 0.00002TSQ + (1.98) (3.72) (0.112) (0.43) (0.79) (1.85)

0.089Q² + 0.22Q³ + 0.042Q₄ - 0.78EDP
(9.59) (21.22) (4.33) (2.62)

R² = 0.951  F(12; 91) = 148.24

R² = 0.944  DW = 0.97
Appendix D: Teenage Employment Equation. Regression Results. GLS Logarithmic. Different Specifications

1 - BASIC - TSQ: \( \ln{\text{TEMP}} = -2.94 - 0.0931\ln{\text{MW}} - 0.1221\ln{\text{PRIMEUR}} - 0.8151\ln{\text{POP}} - 1.37\text{SY} - 0.094\text{AFP} - 1.84\text{EFTPP} + 0.0054\text{T} + 0.09592 \cdot 0.2493 + 0.04594 \cdot 24.64 \cdot 5.14 \cdot 0.97 \cdot 0.114 \cdot 3.82 \cdot 0.316 \cdot 1.27 \)

\( R^2 = 0.967 \)
\( F(10; 92) = 272.90 \)
\( \text{RHO} = 0.68 \)
\( t(\text{RHO}) = 9.58 \)

2 - BASIC - SY: \( \ln{\text{TEMP}} = -2.53 - 0.00685\ln{\text{MW}} - 0.1161\ln{\text{PRIMEUR}} - 0.4061\ln{\text{POP}} + 0.15\text{AFP} - 1.82\text{EFTPP} - 0.00004\text{yT} + 0.00004\text{TSQ} + 0.097\text{Q2} + 0.24\text{Q3} + 0.047\text{Q4} \cdot 11.60 \cdot 23.27 \cdot 5.07 \)

\( R^2 = 0.967 \)
\( F(10; 92) = 265.56 \)
\( \text{RHO} = 0.74 \)
\( t(\text{RHO}) = 11.16 \)
3 - BASIC - AFP

\[ \ln \text{TEMP} = -2.16 - 0.0837 \ln \text{MW} - 0.121 \ln \text{PRIMEUR} - 0.516 \ln \text{POP} - 1.27 \text{SY} - \\
(1.87) \quad (6.34) \quad (1.93) \quad (3.05) \]

\[ 1.80 \text{EFTPP} + 0.0013 T + 0.000043 \text{TSO} + 0.096Q2 + 0.24Q3 + 0.045Q4 \\
(3.77) \quad (0.38) \quad (1.26) \quad (12.61) \quad (25.43) \quad (5.34) \]

\[ R^2 = 0.967 \quad F(10; 92) = 269.67 \]

\[ R^2 = 0.964 \quad DW = 2.02 \]

\[ \rho = 0.649 \]

\[ t(\rho) = 8.67 \]

4 - BASIC - lnPOP

\[ \ln \text{TEMP} = -0.78 - 0.0721 \ln \text{MW} - 1.106 \ln \text{PRIMEUR} - 1.24 \text{SY} + 0.972 \text{AFP} - \\
(1.50) \quad (5.56) \quad (2.85) \quad (0.85) \]

\[ 1.81 \text{EFTPP} - 0.0042 T + 0.000064 \text{TSO} + 0.101Q2 + 0.25Q3 + 0.05Q4 \\
(3.79) \quad (2.56) \quad (5.66) \quad (13.02) \quad (25.84) \quad (5.89) \]

\[ R^2 = 0.967 \quad F(10; 91) = 272.07 \]

\[ R^2 = 0.964 \quad DW = 2.043 \]

\[ \rho = 0.672 \]

\[ t(\rho) = 9.17 \]
5 - BASIC + lnPCWEl

\[
\ln \text{TEMP} = -1.99 - 0.145 \ln \text{MW} - 0.141 \ln \text{PRIMEUR} - 0.521 \ln \text{POP} - 1.29\text{SY} +
\]
\[
1.102 \text{AFP} - 1.92 \text{EFTPP} - 0.00137 + 0.00037 \text{TSO} + 0.089\text{Q}2 + 0.23\text{Q}3 +
\]
\[
(4.33) \quad (10.66) \quad (2.87) \quad (5.03)
\]
\[
0.037\text{Q}4 + 0.09771 \ln \text{PCWEl}
\]
\[
(5.04) \quad (5.41)
\]
\[
R^2 = 0.968 \quad F(12; 90) = 217.63
\]
\[
R^2 = 0.964 \quad DW = 1.89
\]
\[
\rho = 0.33 \quad t(\rho) = 3.63
\]

6 - BASIC + EDP

\[
\ln \text{TEMP} = -1.43 - 0.0821 \ln \text{MW} - 0.127 \ln \text{PRIMEUR} - 0.345 \ln \text{POP} - 1.004 \text{SY} +
\]
\[
0.221 \text{AFP} - 1.60 \text{EFTPP} + 0.00308T + 0.0000156 \text{TSO} + 0.092\text{Q}2 +
\]
\[
(1.81) \quad (6.54) \quad (1.072) \quad (2.33)
\]
\[
0.238\text{Q}3 + 0.044\text{Q}4 - 0.847 \text{EDP}
\]
\[
(23.68) \quad (5.19) \quad (2.28)
\]
\[
R^2 = 0.969 \quad F(10; 90) = 222.48
\]
\[
R^2 = 0.965 \quad DW = 2.05
\]
\[
\rho = 0.648 \quad t(\rho) = 8.63
\]
Appendix E: Teenage Unemployment Equation: OLS Linear. BASIC + PCWEL and BASIC + EDP.

\[
\begin{align*}
\text{TNUR} &= -0.176 - 0.00665929 MW + 1.61 \text{PRIMEUR} + 0.343 SY + 0.035 AFP + \\
&\quad (0.158) \quad (11.12) \quad (3.88) \quad (0.128) \\
&+ 0.469 POP - 0.202 EFTPP + 0.000912 T + 0.00000367 SQ + 0.029 Q2 + \\
&\quad (0.819) \quad (0.74) \quad (1.83) \quad (1.003) \quad (8.34) \\
&+ 0.0073 Q3 + 0.0036 Q4 + 0.03056 PCWEL \\
&\quad (1.91) \quad (0.99) \quad (0.56) \\
R^2 &= 0.857 \quad F(12; 91) = 45.51 \\
\overline{R^2} &= 0.838 \quad DW = 2.04
\end{align*}
\]
2 - BASIC Teenage unemployment equation + EDP

\[ TNUR = -0.134 + 0.0230581 MW + 1.606 PRIMEUR + 0.414 SY - 0.083 AEP + \]
\[ (0.50) \quad (12.31) \quad (4.19) \quad (0.29) \]

\[ 0.676 POP - 0.068 EFTP + 0.001321 + 0.00000705 SQ + 0.0282Q_2 + \]
\[ (1.24) \quad (0.258) \quad (2.30) \quad (1.61) \quad (1.57) \]

\[ 0.0061Q_3 + 0.00401Q_4 - 0.1705EDP \]
\[ (1.12) \quad (1.121) \quad (1.50) \]

\[ R^2 = 0.860 \quad F(12; 91) = 46.64 \]

\[ R^2 = 0.841 \quad DW = 2.06 \]
Appendix F: Estimated Impact of an Increase in the MW, FLS and WI on

Teenage unemployment equation. Simultaneous equations estimation. Instrumental variables method: Different functional forms

TNUR = 0.561 + 0.0035898MW + 1.049PRIMEUR + 0.378SY - 0.183AFP - (0.0855) (2.41) (4.06) (0.565)

0.511POP - 0.235EFTPP + 0.00126T - 0.0000068TSQ + 0.0223Q2 - (0.572) (0.896) (2.29) (1.46) (3.906)

0.000802Q3 - 0.00362Q4 - 0.74044FLS - 0.13384BI
(0.121) (0.59) (1.32) (0.28)

DW = 2.05
2 - Teenage unemployment equation; joint estimation. GLS instrumental variables estimation; linear form.

\[ \text{TNUR} = 0.327 - 0.00389718\text{MW} + 1.27\text{PRIMEUR} + 0.364\text{SY} - 0.156\text{AFP} - (0.096) \quad (3.87) \quad (4.18) \quad (0.544) \]

\[ 0.214\text{POP} - 0.245\text{EFTPP} + 0.00128\text{T} - 0.0000027\text{TSQ} + 0.0267\text{Q} + (0.29) \quad (0.94) \quad (2.47) \quad (1.80) \quad (5.35) \]

\[ 0.0039\text{Q} + 0.00080\text{Q} - 0.508265\text{FLS} + 0.160374\text{W} + (0.70) \quad (0.15) \quad (1.29) \quad (0.686) \]

\( \text{DW} = 1.98 \)
### Teenage unemployment equation: joint estimation, logarithmic form

**instrumental variables method.**

\[
\ln\text{INUR} = 0.386 + 0.0357\ln\text{MW} + 0.4441\ln\text{PRIMEUR} + 0.7861\ln\text{POP} +
\]

\[
(0.46) \quad (4.05) \quad (1.14)
\]

\[
1.9055\text{SY} + 1.545\text{AFP} - 0.371\text{EFTPP} + 0.0044T - 0.00002087S0 +
\]

\[
(2.82) \quad (0.589) \quad (0.211) \quad (1.009) \quad (0.605)
\]

\[
0.2114Q2 + 0.0672Q3 + 0.03907Q4 + 1.9867\ln\text{FLS} + 0.7453\text{WI}
\]

\[
(5.13) \quad (1.43) \quad (0.89) \quad (0.37) \quad (0.25)
\]

**DW = 2.19**
### Teenage Unemployment Equation: Joint Estimation; Logarithmic Form

**GLS Instrumental Variables Method**

\[
\ln TNUR = 0.197 + 0.037697 \ln MW + 0.457146 \ln PRIMEUR + 0.6651 \ln POP + \\
(0.466) \quad (6.35) \quad (1.338)
\]

\[
1.775Y + 1.123AFP - 0.971EFTPP + 0.00668T - 0.0000357TSQ + \\
(3.24) \quad (0.559) \quad (0.579) \quad (1.87) \quad (1.33)
\]

\[
0.226Q2 + 0.0839Q3 + 0.052Q4 + 1.539251NLSP + 1.39704W1 \\
(6.93) \quad (2.59) \quad (1.52) \quad (0.764) \quad (0.83)
\]

\[DW = 2.098\]
Appendix G: Extended Teenage Labor Force Participation Equation.

\[
LFP = 3.86 - 0.137554MW - 2.97PRIMEUR - 0.288SY - 0.2268AFP - 4.69POP \\
4.69POP \times 0.187EFP + 0.0087T + 0.000005TSQ + 0.0369Q2 + 0.091BQ_3 - 0.0049Q_4 - 3.16826FLS + 0.369928WI \\
DW = 1.22
\]
2 - Teenage labor force participation equation: joint estimation. Instrumental variables - GLS; linear form.

\[ TLP = 2.04 - 0.102357MW - 1.42PRIMEUR - 0.35SY + 0.321AFP - 
(1.62) \quad (4.07) \quad (2.31) \quad (0.70) \]

\[ 1.375POP + 0.448EFTPP - 0.001141 + 0.000022TSQ + 0.053Q2 + 
(1.15) \quad (2.38) \quad (0.949) \quad (2.85) \quad (12.12) \]

\[ 0.114Q3 + 0.013Q4 - 1.42O33FLS + 0.071244W1 
(21.11) \quad (2.71) \quad (2.93) \quad (0.734) \]

\[ DW = 2.06 \]

\[ \text{RHO} = 0.615 \]

\[ t(\text{RHO}) = 7.89 \]

$$\ln TLFP = -6.18 - 0.1011 \ln MW + 0.2741 \ln PRIMEUR - 1.421 \ln POP - 2.482 \ln AFP - 0.18 - 0.1011 \ln MW - 0.2741 \ln PRIMEUR - 1.421 \ln POP - 2.482 \ln AFP$$

$$= 1.40EFTPP - 0.2805 \ln SY + 0.005071 \ln TSQ + 0.059Q2$$

$$- 0.16Q3 - 0.0274Q4 - 6.75541 \ln FIS - 0.5502 \ln ELI$$

$$DW = 1.43$$
Teenage labor force participation. Joint estimation. Instrumental variables method; GLS logarithmic form.

\[ \ln(\text{LFP}) = -4.39 \quad - 0.0942578\ln(MW) \quad - 0.1971\ln(PRIMEUR) \quad - 0.9611\ln(POP) \quad - 0.5105Y \quad + 0.00281T \quad + 0.000011T50 \quad + 1.256\text{AFP} \quad + 1.63\text{EFTPP} \quad + 0.00267T + 0.000012TSQ + 0.0863Q2 + 0.193Q3 + 0.000282Q4 - 4.6651\ln(FLS) - 0.04017W1 \]

\[
(2.74) \quad (5.97) \quad (4.020) \quad (1.28) \quad (1.85) \quad (3.22) \quad (1.288) \quad (0.846) \quad (7.41) \quad (13.62) \quad (0.022) \quad (4.77) \quad (0.122)
\]

\[ \text{DW} = 1.94 \]

\[ \text{RHO} = 0.359 \]

\[ t(\text{RHO}) = 3.88 \]
Appendix H: Results of Covariance Procedure: Correlation Coefficients Matrix and Mean, Standard Deviation of TEMP, FLS, WI, MW, TFLP and TNUR.

<table>
<thead>
<tr>
<th></th>
<th>TEMP</th>
<th>FLS</th>
<th>WI</th>
<th>MW</th>
<th>TFLP</th>
<th>TNUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLS</td>
<td>-0.2345</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WI</td>
<td>0.214</td>
<td>-0.343</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW</td>
<td>0.3096</td>
<td>-0.697</td>
<td>0.491</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFLP</td>
<td>0.966</td>
<td>-0.429</td>
<td>0.258</td>
<td>0.417</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TNUR</td>
<td>-0.164</td>
<td>-0.714</td>
<td>0.146</td>
<td>0.377</td>
<td>0.094</td>
<td>1</td>
</tr>
</tbody>
</table>

The correlation coefficient expresses the degree of association between variables. So defined, it provides us with a single measure not only of the direction of the association but the strength of the relationship between two variables while controlling for the effects of one or more variables.

The correlation matrix above shows a negative degree of association between TEMP and FLS (-0.2345) whereas such degree is positive between TEMP and MW (0.3096). This reveals that the relationship between TEMP and MW may be spurious.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMP</td>
<td>0.425769</td>
<td>0.544081E-01</td>
</tr>
<tr>
<td>FLS</td>
<td>0.855251</td>
<td>0.149838E-01</td>
</tr>
<tr>
<td>WI</td>
<td>0.014987</td>
<td>0.109215E-01</td>
</tr>
<tr>
<td>MW</td>
<td>0.307269</td>
<td>0.93308E-01</td>
</tr>
<tr>
<td>TLFP</td>
<td>0.501194</td>
<td>0.633640E-01</td>
</tr>
<tr>
<td>TNUR</td>
<td>0.150153</td>
<td>0.278693E-01</td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY


Hughes, James and Richard Perlman. Economics of Unemployment: Comparative Study of the UK and the USA, 1984.


RESUME DE LA THESE DE Ph.D.
EN ECONOMIE DE ALLECHI M'BEI

Titre: "Minimum Wage, Inflation and Unemployment; a simultaneous equations analysis".

ou

"Salari e Minimum, l'Inflation et le chômage; une analyse à équations simultanées"

Présentée à l'Université du Wisconsin - Milwaukee U.S.A

le 14 Décembre 1984

Cette these analyse les effets du Salaire Minimum Fédéral sur l'emploi ou son revers, le chômage, aux USA; plus particulièrement sur le chômage des adolescents (16 - 19 ans).

En effet, plus de quarante ans après sa ratification, la loi du salaire Minimum demeure encore controversée. Des recherches antérieures ont discuté de cette controverse en examinant divers effets sur l'emploi ou sur le chômage du relèvement du salaire minimum au fil des années.

Concernant les effets du salaire minimum sur l'emploi, les études les plus récentes ont abouti à des conclusions conflictuelles.

.../...
D’une part il a été reconnu que le salaire minimum a un impact substantiel sur l’emploi, spécialement sur l’emploi des adolescents. D’autre part, il a été démontré que l’effet du salaire minimum s’évanouit dès lors que l’on tient compte de la composition changeante de la population active. L’évidence collective de ces recherches rend largement compte des différents effets du salaire minimum sur différents groupes sociaux.

Mais quelle que soit la nature variée des résultats, presque toutes ces études utilisent une méthodologie commune. Celle-ci consiste en une équation unique dans laquelle l’on regresse le salaire minimum et d’autres variables pertinentes sur une mesure de la population active (ou de la force de travail). Cependant, certaines considérations rendent cette approche suspecte.

D’abord, l’un des effets du salaire minimum largement admis est l’augmentation du coût du facteur travail. Les employeurs pour tenir compte de ce coût élevé, réagissent en fixant des prix élevés à leurs produits ; ainsi il y a une génération simultanée de la spirale salaire-inflation et prix-inflation.

Ensuite, l’un des phénomènes les plus remarquables dans l’histoire de la population active américaine est la croissance séculaire du taux de participation des femmes dans l’activité économique et plus particulièrement des femmes mariées.

Néanmoins, la plupart des travaux antérieurs ont manqué d’incorporer de manière explicite ces facteurs dans leurs modèles d’analyse ; et les résultats obtenus ont dû être biaisés.

.../...
Pour éliminer ces biais, cette dissertation développe un modèle de trois équations simultanées qui comprend l'offre de travail féminine et l'inflation générée par les coûts du facteur travail.

L'objectif principal de cette recherche est donc d'apporter la lumière sur cette controverse du salaire minimum fédéral en employant une méthode nouvelle et en y incluant des facteurs nouveaux qui sont apparus sur le marché du travail.

Afin de rendre nos résultats comparables à ceux de travaux antérieurs, cette dissertation a utilisé des données trimestrielles de 1954 à 1979.


L'estimation empirique s'est faite par étapes. D'abord, les variables relatives à l'offre de travail des femmes et celle de l'inflation par les coûts furent introduites comme exogènes. Mais puisque ces deux variables sont elles-mêmes déterminées par d'autres facteurs dont le salaire minimum entre autres, elles furent ensuite introduites comme variables endogènes et dès lors la méthode d'équation simultanées a été employée pour évaluer l'impact de ces deux variables sur l'emploi (ou sur le chômage) des adolescents. La technique des moindres carrés à deux étages et celle des variables instrumentales furent employées, alternativement.

Concernant l'introduction des nouvelle variables explicatives comme exogènes, les résultats démontrent une très grande sensibilité entre la méthode des moindres carrés ordinaires et celle des moindres carrés généralisés. Mais à cause de la présence d'autocorrélation, l'accent est porté sur les résultats obtenus à partir des moindres carrés généralisés.

.../...
Les estimations passées révèlent qu'une augmentation de 10 pour cent du salaire minimum conduisait à une réduction de 1 à 3 pour cent du niveau d'emploi des adolescents. Nos résultats montrent une réduction de zéro à un pour cent de réduction du niveau d'emploi des adolescents suite à 10 pour cent d'augmentation du salaire minimum.

Mais dès que l'on étend le modèle aux deux nouvelles variables, l'on note des variations considérables dans les résultats. En substance, l'effet négatif du salaire minimum disparaît presque totalement ; et dans tous les cas, cet effet n'est plus significatif statistiquement.

En revanche la variable "offre de travail féminine" exhibe un effet négatif très fort et statistiquement significatif sur le niveau d'emploi des adolescents. Nos estimations montrent qu'une augmentation de 10 pour cent de l'offre de travail féminine conduit à une réduction d'environ 28 pour cent du niveau d'emploi des jeunes. Et cet effet négatif s'est maintenu à travers différente spécification et différentes formes fonctionnelles, linéaire et log-linéaires.

Quant à la variable "inflation par les salaires", elle montre un effet positif sur l'emploi des jeunes, mais cet effet n'est pas significatif.

Nous avons également exploré le comportement des variables explicatives en utilisant un système d'équations simultanées quand ces variables sont endogènes. Ici encore, l'on découvre des variations importantes au niveau des résultats.

Le salaire minimum a un effet négatif très réduit et non significatif sur l'emploi des adolescents. La variable "inflation des salaires" montre quant à elle un effet positif mais toujours non significatif. Seule la variable de l'offre de travail des femmes démontre avec constance un effet négatif important et statistiquement significatif, .../...
quelle que soit la spécification et la forme fonctionnelle utilisée. Nos estimations montrent qu'à la suite d'une augmentation de 10 pour cent de salaire minimum et de l'offre de travail féminine, il s'ensuit une réduction de 0,34 pour cent et de 20,83 pour cent du niveau d'emploi des adolescents, respectivement. Ces variables ont le même effet quand la variable à expliquer est le taux de participation de la population active des adolescents. Nous avons trouvé, comme d'autres études de par le passé, un retrait des adolescents de la population active à la suite d'une augmentation de la population active. Néanmoins, le retrait de la force de travail émanant d'une augmentation de l'offre de travail des femmes est d'une grandeur plus élevée.

Les études antérieures ont accepté le retrait étonnamment grand des adolescents de la population active sans autre explication que celle imputable à l'effet négatif du salaire minimum. Mais l'on note que l'influx des travailleurs de sexe féminin dans la force de travail s'est accru d'une proportion de un tiers avant la seconde guerre mondiale à son niveau actuel de cinquante trois pour cent. L'on peut donc faire l'hypothèse légitime que cette croissance de la force de travail féminine est un facteur sous-jacent à prendre en compte dans l'évaluation des déterminants du retrait des adolescents de la force de travail.

Bien sûr, cette hypothèse n'indique pas nécessairement une relation de causalité entre le taux de participation des adolescents à la force de travail, et l'offre de travail féminine à la hausse. Plutôt nos résultats sont consensuels avec la forte corrélation négative entre ces deux groupes de travailleurs qui peut expliquer "à quel degré les femmes, surtout les femmes mariées et les adolescents sont des facteurs substituables dans la Production" comme l'on observé Hamermesh et Grant. 

.../...
Les résultats deviennent difficiles à interpréter quand le taux de chômage des adolescents est utilisé comme la variable dépendante. Les effets d'une croissance des variables explicatives concernées sur le taux de chômage sont soit très petits, soit du signe contraire.

En outre, les coefficients estimés exhibent une très grande imprécision comme le démontrent les écarts-types des erreurs très élevés.

Cette imprécision et cette insignificance des résultats accordent du crédit à la notion déjà acceptée selon laquelle le taux d'emploi et le taux de participation à la force de travail, sont de meilleures mesures descriptives des conditions du marché de travail que ne l'est le taux de chômage qui est entaché de problèmes d'erreurs de comptage.

Les implications de formulation de politique d'emploi des résultats de cette recherche sont de grande importance. En effet, l'un des projets souvent suggérés pour résorber le taux de chômage élevé des adolescents consiste en la fixation d'un "sous-salaire minimum" ou "d'un salaire minimum dual" pour les adolescents.

Les débats au congrès des USA sous la poussée de l'administration Reagan en est une expression. Nos résultats suggèrent qu'une telle politique de réduction de salaire minimum à un taux inférieur spécifiquement pour les adolescents, si elle est appliquée isolemment, ne saurait être le remède espéré contre le chômage global des adolescents. Plus important encore, les résultats de nos recherches mettent en doute l'adéquation d'une proposition de sous-salaire minimum comme une politique viable pour résoudre le taux de chômage élevé des adolescents.

D'un côté, les résultats de nos recherches ont montré qu'une augmentation dans la variable offre de travail des femmes a eu de manière consistente, un effet suffisamment négatif et statistiquement significatif.../...
sur le niveau d'emploi et sur le niveau de participation à la force de travail des adolescents. De l'autre, le salaire minimum a révélé une certaine ambiguïté quant à son effet négatif à la fois sur le niveau d'emploi et sur le niveau de leur participation à la force de travail des mêmes adolescents, surtout quand le modèle est estimé en utilisant le système d'équations simultanées. La variable de l'inflation par les salaires a eu constamment un effet positif sur l'emploi et la participation des adolescents ; mais cet effet est si minime que l'on peut avancer sans grand risque qu'elle n'a pas d'effet significatif sur les variables à expliquer.

En conséquence, étant donné l'incertitude entourant l'effet d'une augmentation de salaire minimum sur l'emploi et le taux de participation des jeunes, l'on devrait considérer la proposition de la "différentielle" du salaire minimum avec attention. A un niveau conceptuel, le "salaire minimum dual" ou "salaire minimum différentiel", selon ses avocats défenseurs, réduirait le taux de salaire que les employeurs paieraient aux adolescents en dessous du niveau national du salaire minimum et toujours se conformer à la loi du "Fair Labor Standards Act" de 1938 qui a établi le salaire minimum au plan national. Ainsi donc, avec un salaire plus bas, continuant les défenseurs, ce "salaire minimum dual" réduirait le chômage des adolescents car nombreux d'entre eux seraient employés selon les prescriptions de l'économie de travail classique. Concrètement il a été suggéré au congrès que l'on paie aux adolescents environ 75 à 85 pour cent du salaire minimum.

En revanche, les opposants soutiennent qu'un tel salaire minimum dual sera établi aux dépens des anciens travailleurs au taux de salaire élevé ; car les employeurs soucieux de réduire les coûts de Production et de maximiser le profit, vont substituer les jeunes aux vieux. Cela poserait d'autres problèmes sociaux graves car les travailleurs âgés ont des responsabilités familiales et leur mise au chômage par substitution aura des conséquences sérieuses. Mais comme cela a été mentionné plus haut, l'on...
ne peut ignorer l'influence énorme des femmes sur le marché du travail si l'on veut offrir une analyse complète de l'effet du salaire minimum.

En effet, si ce salaire minimum dual proposé doit aider à réduire le chômage des jeunes comme l'on anticipe, il doit être établi en dessous de ce que l'on appelle le taux de salaire de réservation des femmes c'est-à-dire un "taux frontière" qui incite la femme à choisir entre le "travail de foyer" et le travail rémunéré, si et seulement si le salaire minimum est en dessous du taux de réservation des femmes, alors cela pourrait encourager les femmes à se mettre en retrait du marché et induire les jeunes à occuper les emplois vacants ou potentiels. Mais le problème est qu'à ce niveau là, le salaire minimum sera si bas que seuls les travailleurs immigrés sans aucun taux de réservation, accepteraient de travailler.

En plus, les adolescents ne constituent pas un groupe homogène faisant face à un taux de salaire minimum unique. Par exemple l'on a observé (page 20 de la thèse) qu'en 1978, un taux de chômage de 13,9 pour cent pour les adolescents blancs contre 36,3 pour cent pour les adolescents noirs.

Si donc d'autres facteurs tels que la discrimination raciale interviennent dans la détermination du chômage, alors une politique simple d'un taux de salaire dual ne saurait être effective.

Nous avons donc suggéré au commencement que nous serons en faveur d'une politique économique conduisant à une croissance globale continue qui permettrait à l'économie d'aborder la force de travail en augmentation, plutôt que d'adopter une option politique dont l'effet ultime serait de confronter un segment du Marché du Travail à un autre. Dans une économie en expansion, le taux de salaire sera basé sur le nombre d'emplois et non sur les caractéristiques des gens qui occupent ces emplois.