CREDIT

Minimum Wages and Compliance:
The Case of Trinidad and Tobago

by

Eric Strobl and Frank Walsh

Centre for Research in Economic Development and International Trade, University of Nottingham

The Centre for Research in Economic Development and International Trade is based in the School of Economics at the University of Nottingham. It aims to promote research in all aspects of economic development and international trade on both a long term and a short term basis. To this end, CREDIT organises seminar series on Development Economics, acts as a point for collaborative research with other UK and overseas institutions and publishes research papers on topics central to its interests. A list of CREDIT Research Papers is given on the final page of this publication.

Authors who wish to submit a paper for publication should send their manuscript to the Editor of the CREDIT Research Papers, Professor M F Bleaney, at:

Centre for Research in Economic Development and International Trade,
School of Economics,
University of Nottingham,
University Park,
Nottingham, NG7 2RD,
UNITED KINGDOM

Telephone (0115) 951 5620
Fax: (0115) 951 4159

CREDIT Research Papers are distributed free of charge to members of the Centre. Enquiries concerning copies of individual Research Papers or CREDIT membership should be addressed to the CREDIT Secretary at the above address. Papers may also be downloaded from the School of Economics web site at:
 www.nottingham.ac.uk/economics/research/credit

No. 01/12

Minimum Wages and Compliance:
The Case of Trinidad and Tobago

by

Eric Strobl and Frank Walsh

Centre for Research in Economic Development and International Trade, University of Nottingham

The Authors
Eric Stroble and Frank Walsh are both Lecturers, Department of Economics, University College Dublin.

July 2001

Minimum Wages and Compliance: The Case of Trinidad and Tobago

by

Eric Strobl and Frank Walsh

Abstract

On April the 6th of 1998 the government of the Republic of Trinidad and Tobago introduced a National Minimum Wage for the first time.   Using the Trinidad and Tobago labour force survey we show that potential costs, if there had been full compliance, could have been substantial. An examination of employment and the wage distribution in aggregate shows that the actual degree of compliance was fairly low however. Nevertheless, an econometric investigation on a panel of individuals provides evidence that the minimum wage did cause some individuals to experience a wage increase, while others consequently lost their job. Differential impacts across firm size suggest that the 'formality' of the firm may be an important factor in compliance.

Outline
1. Introduction
2. The Trinidad and Tobago Labour Market
3. Data
4. Potential Cost
5. Actual Compliance: Aggregate Evidence on Employment and the Wage Distribution
6. Longitudinal Evidence on Compliance
7. The Effect of the National Minimum Wage on the Probability of Job Loss
8. Concluding Remarks

I   INTRODUCTION

The impact of minimum wages on the labour market has consistently attracted a large amount of attention in the economics literature. Most empirical studies have focused on the effect on employment and the distribution of income and wages, although there has not been no clear consensus on these issues (see Brown (1999) for a survey). While there are a large number of empirical case studies of industrialized countries, corresponding research on developing countries still remains scarce despite its likely greater importance in potentially reducing poverty.[1] Exceptions include Bell (1997), who, using data on firms in Mexican and Columbian manufacturing, finds that there were no employment effects in Mexico, while there were negative employment effects in Columbia. In a case study of changes in the minimum wage in Indonesia, Rama (1996) finds that these caused the average wage to increase and employment to decrease.

An important aspect of minimum wages in the developing world is the degree of compliance, given that regulatory structures tend to be substantially less developed relative to the industrialized world. While it is likely that there will be some non-compliance in industrialized labour markets, this tends to be small and hence has received little attention.[2]   In contrast, compliance appears to constitute an acute problem in developing nations. For example, Bell (1994) finds that in 1988 in Mexico 66 per cent of females in various sectors were being paid below the minimum wage, whereas in Morocco more than 50 per cent of firms paid their unskilled workers less than the minimum wage (Harrison, 1993). Additional evidence indicates that a large part of the reason for the high degree of non-compliance in developing countries is due to the large size of their informal sectors – for example, Morrisson (1993) discovered from a survey of Nigerian informal sector firms that 98 per cent did not comply with minimum wage legislation, while the equivalent figure for a sample of informal sector firms in Swaziland was 83 per cent.[3]

---

1 For instance, Lustig and McLeod (1997) find that for a cross section of developing countries higher minimum wages are associated with lower levels of poverty.

2 Card (1991) finds that non-compliance in the US labour market was less than 2 per cent.

3 It must be noted, however, that the degree of non-compliance among the informal sector appears to be particularly high in Sub-Saharan Africa. In contrast, the same author finds that the equivalent figures for Thailand and Ecuador were 10 and 11 per cent, respectively.

Apart from the aforementioned statistics, detailed empirical analysis of the problem of compliance to minimum wages in developing countries has, however, remained largely unexplored; see Harrisson and Leamer (1997). One exception is the study by Jones (1998) who finds that minimum wage legislation in Ghana caused a reduction in employment in the formal sector and an increase in the informal sector, where in the latter compliance is assumed to be low. In contrast, a number of theoretical models dealing with the lack of compliance in developing countries have been proposed; see, for instance, Harrisson and Leamer (1997), Jones (1998), and Squire and Suthiwart-Narueput (1997). For example, Squire and Suthiwart-Narueput (1997) show that the likelihood of non-compliance will be greatest when the minimum wage is binding and the relevant supply and demand elasticities are high.

The introduction of a statutory national minimum wage on April 6th of 1998 in the Republic of Trinidad and Tobago along with access to a large micro rotating panel data set for the years 1996 through 1998 allows us to further address the issue of compliance to minimum wages in the developing world. The national minimum wage in Trinidad and Tobago, requiring a uniform specified minimum hourly payment to all workers regardless of age or type of work, was introduced in response to a report by the World Bank and largely unanticipated. It thus can be argued to be at least weakly exogenous, providing us with a semi-natural experiment. Moreover, as we will show, potential costs of full compliance would have been substantial. This institutional setting in conjunction with our data set allows us not only to examine the nature of compliance to the national minimum wage in general, but the longitudinal nature of our data also enables us to trace the effect on the wages and employment at the individual level. Given that, as Tybot (2000) argues, smaller firms are more likely to avoid regulatory structures, we moreover explicitly focus on the differential effects across firm size.

Our paper proceeds as follows. The following section provides a brief outline of the Trinidad and Tobago labour market and the introduction of the national minimum wage. In Section III we describe our main data source, the Trinidad and Tobago Continuous Sample Survey of Population (CSSP). In the subsequent section we use these data to calculate the potential costs associated with the national minimum wage. In Section V we examine the actual incidence of compliance in terms of employment and the wage distribution. We exploit the panel nature of our data set to examine whether the national

minimum wage caused compliance or caused job losses at the individual level in Sections VI and VII, respectively. Section VIII concludes.

II THE TRINIDAD AND TOBAGO LABOUR MARKET[4]

At the onset of the 1980s the socio-economic conditions in Trinidad and Tobago were relatively good; the country enjoyed one the highest standards of living in the developing world due to its large number of natural resources, in particular oil. The decline in oil prices coupled with the problems common to almost all developing countries over the 1980s, namely debt crisis and the world-wide recession, provoked a considerable reversal in these relatively good economic conditions. For instance, the unemployment rate more than doubled from 9.1 per cent in 1982 to 22.0 per cent by 1989. There is some evidence that this period was also accompanied by considerable movements of employment from the formal to the informal sector, particularly since there is no formal system of unemployment compensation in Trinidad and Tobago.[5] In terms of the skill composition of employment this meant for many a move from the relatively skill intensive formal industrial sectors to jobs of lower levels of technological sophistication and productivity in the informal sector. The economic recession was also reflected in a considerable fall in the real wage rate in practically all sectors; for example, from 1983 to 1995 the real wage rate fell by over 9 per cent; a trend apparent in almost every other sector of the economy. In recent years, however, the Trinidad and Tobago economy has, relative to other Caribbean countries, managed to recover noticeably.

Against this economic backdrop, one must also consider the Trinidad and Tobago labour market institutions.   As noted by Rambarran (1998) the Trinidad and Tobago (formal) labour market has "traditionally been characterized by politically strong, oligopolistic firms producing for the domestic market and an equally powerful and aggressive trade union movement concentrated in the energy-related, capital intensive manufacturing and public sectors" (p. 210). The most important pieces of labour legislation are the Industrial Relations Act, the Retrenchment and Severance Payments Act, and, more recently the Minimum Wage Act. The Industrial Relations Act serves as a corporatist instrument in

---

4 Most of the information on the Trinidad and Tobago labour market is taken from Rambarran (1998).

5 The government does in some cases provide temporary work for unemployed persons, although this will only last a few weeks at a time and certainly can not be considered an adequate form of unemployment compensation.

that it sets forth legislation concerning strikes and the registration and certification procedures for trade unions. One should note that while a deal negotiated between the majority union and the employer in question covers all workers in the area of activity, the essential bargaining process and scope of coverage remain essentially decentralized. Moreover, these agreements probably cover no more than 20 per cent of those employed.

The Retrenchment and Severance Payments Act guarantees severance payments as a function of the length of uninterrupted service in the case of dismissal due to redundancy, generally ranging between two and three weeks for each year of service. It has been argued however, see, for instance, Rambarran (1998), that although this legislation has in theory considerably constrained the flexibility of employers, many have reacted by substituting full-time labour with part-time and temporary workers which are not covered by the legislation.

While the legislative framework enabling the introduction of minimum wages in Trinidad and Tobago was first passed in 1976, it has until recently remained fairly idle. Minimum wages prior to the national minimum wage introduced in 1998 have only covered a small number of specific sectors covering only a small proportion of total employment. Specifically, minimum wages were implemented for a select number of occupations in the security industry and the catering industry, for shop assistants, for petrol filling stations, and domestic assistants. As can be seen from Table 1, most the rates were considerably lower than $TT7.00, the level at which the national minimum wage was later set. Moreover, in practice these rates appear to not have been strictly enforced, if at all.[6]

It was only in response to a World Bank Report[7] strongly recommending the introduction of a national minimum wage to reduce poverty that The Ministry of Labour and Cooperatives set up a Minimum Wages Board to investigate the issue. This board subsequently completed an investigative report on the matter in July of 1997, specifically recommending the introduction of a national minimum wage at a rate of $TT7.00 per hour covering all workers and types of work without exception. The actual level of $TT7.00 was derived by taking into consideration (i) the few already existing minimum wages, as

---

[6] For instance, even though the set minimum wage for the security industry was TT$5.50, most companies were still paying their workers only between TT$3 and TT$4 an hour; see *Express* 29/07/95, p.3.

noted above, (ii) the cost of basic ingredients for a well-blanced diet, and (iii) the most recent estimate of the poverty line deemed to be $TT623.00 per month for a single household. The national minimum wage was finally introduced on the 6th of April, 1998, at the rate of $TT7.00 per hour, covering all employment regardless of the nature of employment. It has since then remained at this level, although recently there has been some discussion on increasing it to $TT10.00 an hour.

Two other points regarding the implementation of the minimum wage are important. First of all, one should note that the national minimum wage was largely unanticipated at the time, or at least its implementation seemed to have at first lacked credibility. For instance, although a draft of the proposed minimum wage order was officially published in January of 1998, the subsequent required public meeting, which was announced and published in all major newspapers, was surprisingly poorly attended.[8] Moreover, few organizations submitted official comments. It is only after implementation that individual employers and employer organizations voiced considerable disapproval and sought a delay in implementation or total discarding of the legislation.[9] Given this historical background we can credibly argue that in T&T the introduction of a minimum wage constituted an at least weakly exogenous legislative change, and that, given that the minimum wage was equal for all workers, the variation in the gap between the wage and the minimum wage across workers was also exogenous.

Secondly, actual implementation and enforcement was far from perfect. For one, there may have been confusion and uncertainty in terms of the actual details of the Order. The final draft that was implemented was in many regards quite different from the draft published in January. In particular, the draft made no mention of how to define work days or work weeks, nor was there any mention of how to treat overtime work. Moreover, even in the final draft these issues appear to have been somewhat confusing to employers or at least prompted them to stall implementation until clarity was achieved.[10]

---

7 World Bank Report No. 14382-TR, October, 27, 1995.

8 This fact arose out of conversations with Mr. Lennox Marcelle, legal counsel to the Ministry of Labour and Cooperatives.

9 It is instructive in this regard to note the lack of articles in the three major newspapers, *Guardian*, *Newsday*, and *Express*, on the matter until shortly after implementation. .

Public perception has also been that employers in many cases simply chose to ignore the new legislation.[11] In some instances this went as far as making their employees sign documents for labour inspectors stating that they were being paid the minimum wage when in fact they were not. Moreover, detection of compliance and actual enforcement were poor at best.[12] It must also be noted that the maximum penalty for non-compliance was probably not a strong deterrent – until the year 2000 the maximum penalty was either TT$2,000 in fines or two years imprisonment. For example, in the first year after implementation the Ministry of Labour was only able to collect TT$30,000 from some 400 employers[13], and the first charge of non-compliance did not occur until February of 1999.[14]

III   DATA

Our data source is the Continuous Sample Survey of Population (CSSP). The CSSP was designed as a multi-purpose household survey in 1963 with its primary objective being to provide up-to-date data on the labour force characteristics of the population of Trinidad and Tobago on a continuing basis. As such it has served as the primary source for aggregate statistics on the Trinidad and Tobago labour market, collecting a wide array of labour market relevant information on members of the households surveyed. Since 1987 the CSSP has been carried out on a quarterly basis, with the duration of each quarter to last exactly three months, with each month consisting of two periods of a fortnight's duration. Moreover, it is a rotational survey in that households are surveyed three times – a year after the first interview and a last time the quarter subsequent to the second interview.   This latter aspect allows us to create short panels for a large number of individuals.[15]   With regard to the current paper we have gained access to the 1996-98

---

10 See *Newsday*, 14/04/98.

11 See, for instance, *Guardian*, 16/06/98, *Newsday*, 25/11/98, and *Guardian*, 10/05/98.

12 According to Mr. Lennox Marcelle the main problems were that there was not a specific labour court to deal with matters in this regard, labour inspectors were given little to no instruction on how to detect non-compliance, and workers were fearful of losing their jobs if they did complain.

13 *Newsday*, 14/05/00.

14 *Newsday*, 25/02/99.

15 Given the CSSP's close parallel in structure to the US CPS, we used a similar algorithm to that proposed by Madrian and Lefgren (1999) to link individuals over time. This involves using questionnaire, household and time invariant individuals information to link individuals and then using age and its anticipated possible range of changes over time to double check the merges. This allowed us to link 64,700 individuals, of which about 46,000 were of working age.

CSSP surveys.[16] For all calculations we have excluded the self-employed and those working the government sector.

Our key variable is the hourly wage rate, and hence its calculation deserves specific attention. Our data set only provides us with gross monthly income and hours worked in the previous week as placed in a number of hour categories. In calculating the hourly wage rate we thus assumed that the actual hours worked in the categories to be the midpoint of each category[17], multiplied this number by four, and then divided monthly gross income by the number of estimated hours worked that month. Given that it is likely that many full time workers' hours are centered around 40 hours per week, we also defined the hours of all workers that fall in the 33-40 category as 40 per week. Each quarter of our data set gives us on average observations on wages for 3,000 individuals.

Another important distinction made in our analysis is between workers employed in large and those working in small firms. In developing countries there is usually a sizeable informal sector that may in many cases escape the regulatory umbrella that large firms must operate under. Information on the 'formality' of the firm in which a worker is employed is typically hard to obtain, particularly from labour force surveys. However, according to the International Labour Organisation one of the defining characteristics of firms operating in the informal sector is their size, generally employing fewer than 10 persons.[18] Given this and that our data only allows us to determine whether workers worked in firms less than or equal to more than ten workers, we used 10 employees as the cut-off point between what we consider to be large and small firms. Our firm size variable may thus serve as a crude proxy for whether the firm potentially operates in the informal sector.

---

16 The only variable that we were denied access to was that of the ethnic background of the individuals surveyed. This is a standard procedure at the Trinidad and Tobago Central Statistics Office. However, it is unlikely that our inability to control for ethnic differences will significantly bias our results. Firstly, Trinidad and Tobago prides itself as one the foremost (racially) non-discriminatory and racially harmonious societies. Secondly, over the past generations there has been a considerable amount of racial intermixing so that it would be often difficult to divide individuals into separate ethnic categories without a considerable amount of error.

17 For the final category, 70+ hours, we simply added 3.5 hours, half the distance between most categories.

18 See Jones (2000).

IV   POTENTIAL COST

An important determinant of compliance to a minimum wage is the cost involved in doing so. Squire and Suthiwart-Narueput (1997) note that in the private sector this will involve weighing the returns to non-compliance relative to its detection costs, the latter being determined by both the probability of detection and the penality associated with detection. We have already noted that monitoring in Trinidad and Tobago was likely to be poor and that penalities associated with detection were fairly low. The returns to non-compliance are of course just the avoidance of compliance costs. As noted by Squire and Suthiwart-Narueput (1997), several cases indicate that non-compliance rises with the costs of compliance. For example, in Puerto Rico aggregate non-compliance rose from 20 to 35 per cent when the minimum wage rose by 30 per cent.[19] Similarly, Bell (1994) finds that non-compliance in Mexico fell when the real minimum decreased in the late 1980s.

In order to estimate the potential cost of the minimum wage in Trinidad and Tobago, we proceed as follows. The potential cost in any particular industry is assumed to constitute the impact on that industry's wage bill if the minimum wage were fully enforced and employment remained constant. The wage bill, WB, in aggregate, or by any sub-sector, is given by:

$$WB = \sum_{i=1}^{j} w_i l_i + \sum_{k=j+1}^{n} w_k l_k$$

where w_i and l_i are the hourly wage rate and employment (measured as employment times hours worked) at that wage level for workers working for less than w^{MW}, i.e., \$TT 7.00 an hour, throughout the text referred to as low wage workers for convenience sake. w_k and l_k are the respective wage rates and employment levels for workers working above the minimum wage level. If firms were forced to pay the minimum wage then, ceteris paribus, the percentage change in the wage bill holding employment of all workers and the wage rate of high wage workers fixed in any given period t would be:

$$PC_t = \frac{\sum_{i=1}^{j} (w^{MW} - w_{it}) l_{it}}{\sum_{i=1}^{j} w_i l_i + \sum_{k=j+1}^{n} w_k l_k} * 100$$

where w^{MW} is the minimum wage level. This measure thus allows us to take into account both the incidence and degree of wages being paid below the minimum level prior to the implementation of the minimum wage as factors of the potential cost.

Using employment wage levels from the last two quarters in the year prior to the minimum wage, we calculated the potential cost, measured in terms of the average monthly wage bill in 1998 second quarter prices, and the proportion of low wage employment for the total sample and various sub-samples in Table 2.[20] First of all, as can be seen, nearly 36 per cent of workers (weighted by monthly hours worked) at the end of 1997 were being paid less than the minimum wage level that was to be introduced less than a year later. The proportion of these is higher for females in both large and small firms and dramatically higher in small firms relative to large regardless of gender. In small firms 56.4 and 79.9 percent of males and females respectively were paid less than the minimum wage. This gives some support to our contention that a significant proportion of small firms operate in the informal sector, offering low wage jobs potentially outside the regulatory umbrella. If all small firms were actually in the informal sector, then this sector would constitute about 38 per cent of the labour force in Trinidad and Tobago.

Our potential cost calculation reveals that, ceteris paribus, under full compliance the wage bill in the Trinidad and Tobago economy would have increased by 6.4 per cent. On average the potential cost of compliance would have been higher for those employing more females. Moreover, small firms would have carried most of the burden – for example, in the case of females the wage bill would have increased by nearly 80 per cent.

We also calculated the proportion of low wage workers and the potential cost of the national minimum wage across broad one digit industry groups given data on the last two quarters of 1997, as shown in Table 3. As can be seen, there is considerable variation in terms of the potentially affected proportion of employment across these industrial categories. Low wage workers were most dominant in agriculture and the services

---

[19] Of course, to associate this pattern with causality would require no changes in other relevant factors, including the intensity of enforcement.

[20] We chose to use the last two quarters in 1997 rather than the first or first two quarters in 1998 in order to avoid potential seasonal effects biasing our results.

sectors, and, accordingly, the potential cost of a national minimum wage at $TT 7.00 was highest in these. One should note, however, that the agricultural sector, although with the highest potential cost, only constituted 3.5 per cent of the total Trinidad and Tobago labour force.

V   ACTUAL COMPLIANCE: AGGREGATE EVIDENCE ON EMPLOYMENT AND THE WAGE DISTRIBUTION

A. Employment

One route to assess actual compliance is to examine the change in the proportion of low wage workers after implementation. Using our data for the years 1996 to 1998 we calculated and graphed the quarterly proportion of total hours worked by low wage workers (paid less than $TT 7.00 an hour) in large and small firms for the full sample and by gender over time, in order to crudely assess the employment effects of the national minimum wage, as shown in Figure 1. Accordingly, there appears to have been a downward trend in the proportion of low wage workers in both small and large firms even prior to the introduction of the national minimum wage, indicating that there may have been positive real wage growth of low wage workers for the latter half of our sample period even in the absence of a minimum wage, a fact which makes estimating the degree of compliance with the minimum wage more difficult. In general, even if we break up our sample into males and females, it is difficult to gauge a direct effect of the minimum wage on the proportion of low wage workers. Part of the reason for this is that there appears to be some seasonal effects in the trends, making it difficult to disentangle general trends and sudden changes.

The most striking feature of Figure 1 for all sub-groups is the proportion of workers being paid below the minimum level even after implementation in the third last quarter. This suggests a large degree of non-compliance, particularly in small firms where on average 60 per cent of the work force were continued to be paid below the minimum level. We also find that non-compliance was common across gender groups. For example, over 70 per cent of female workers receive less than the minimum level even after implementation of the national legislation.

In Figure 2 we also graphed for low wage workers the average gap between the iractual wage rate and the minimum level for our total sample and sub-groups. Accordingly, there

is no discernable dip in the average gap in the final two quarters of 1998 for all of these. Together Figurew 1 and 2 indicate that the minimum wage did not affect most low wage workers.

B. Wage Distribution

Another manner of assessing compliance is to examine the wage distribution. A standard, non-parametric, approach of studying the wage distribution is to calculate Kernel Density estimates according to the following formula.

$$\hat{f}_k = \frac{i}{nh} \sum_{i=1}^{n} K[\frac{x = X_i}{h}]$$

where f_k are probability estimates of wages falling at or near different values, X_i, and the range of the data is broken into overlapping bands of width h (which is chosen to minimise the mean squared error). The Kernel function thus attaches weight to each of the n observations in the bandwidth, with less weight going to points further from the midpoint of the bandwidth. Additionally we weighted each wage rate observation by the number of hours worked.

In the empirical literature there have been a number of approaches to estimating the impact of minimum wages on the wage distribution using Kernel density estimates. The main challenge has been to find an appropriate counterfactual distribution for pre-post minimum wage comparison purposes. Using US data Meyer and Wise (1983) adopt a parametric approach that involves assuming that the tail of the distribution left of the minimum wage disappears. Given our focus on non-compliance this approach is clearly not suitable here. Dinardo et. al. (1996) adopt a semi-parametric approach to examine what role that changes in minimum wages played in wage inequality over the 1980s in the US. Specifically, they assume that there was no employment loss or spillover effects associated with changes in the minimum wages, and take, except for allowing for changes in the distribution of worker characteristics, the initial wage distribution as the counterfactual wage distribution. In contrast, given the intricacies of our case study, we adopt a much less restrictive and for our purposes more natural approach in that we simply take the wage distributions prior to the minimum wage as the counterfactual distributions. Implicitly we are thus assuming that neither the quantities for worker characteristics, nor their prices, on the whole have changed substantially over our relatively short sample period.

Kernel density estimates of the wage distribution of the third and fourth quarters of 1996, 1997 and 1997-1998 are given in Figure 3[21] [22]. As can be seen, there is little difference between the wage distributions in 1996 and 1997. In contrast, there is a slight shift in the lower part of the wage distribution, i.e. a movement of the peak towards the minimum wage level in 1998. There is also some indication of positive spillover effects on workers just above the minimum. [23] The similarity of the distributions over the three years apart from changes in the lower tail in large firms, which can arguably be associated with implementation of the minimum wage, lends credence to our assumption that the previous years wage distribution is a reasonable counterfactual wage distribution.

Figures 4 and 5 depict the Kernel density estimates for the third and fourth quarter of 1997-1998 by firm size and gender. The overall distribution for 1996 and 1997 are almost identical as are the distributions between 1997 and 1998 apart from a small shrinking in the left hand tail and a movement of the peak up to $TT7.00 in 1998. The wage distribution for workers of either gender in small firms is practically identical before and after the minimum wage indicating that small firms were largely unaffected and did not implement the minimum wage. For large firms there is some evidence of a spike at the minimum wage and a shrinking of the lower tail of the distribution, particularly for females, indicating that there was some enforcement in large firms.

VI   LONGITUDINAL EVIDENCE ON COMPLIANCE

Our aggregate results suggest that there was little compliance to the minimum wage. The longitudinal nature of our data allows us to further investigate this at the individual level. Specifically, we are able to link observations on workers in 1996 and 1997 who were paid less than TT$7.00 to their wage rates taken from their second interview, a year later, if

---

21 We focus on the distribution in the third and fourth quarters given that the minimum wage was implemented in the second quarter of 1998 and to abstract from seasonal effects.

22 The vertical line in all Kernel density graphs identifies the minimum wage level.

23 Such positive 'spillover' effects have been noted in numerous occasions in the minimum wage literature. Specifically, as argued by Brown (1999), an increase in the wages of those workers directly affected will make substitutes for these workers more attractive and hence raise the demand for these wages of those already working and more may be pulled into the labour force. Given our focus in this paper on compliance a detailed study of such spillover effects, although admittedly worthy in its own right, is beyond the scope of the present paper.

these individuals remained employed.[24] Thus the second interview for some of these, namely those whose first observation was after April 1997, will have taken place after the implementation of the national minimum wage and hence their probability of being paid above the minimum wage can be compared to others in the sample to assess the impact of the minimum wage. In particular, we model the probability of low wage workers remaining below the minimum level of TT$7.00 as:

y = f(X, Z, MW)

where y is an indicator variable taking on the value of one if an individual's wage rate was at least TT$7.00 a year later and zero otherwise, *X* and *Z* are vectors of worker and firm characteristics, respectively, and *MW* is a zero one type dummy taking on the value of one if the second observation of a worker is after the implementation of the minimum wage, i.e. any time after April 1998. One should note that, given the nature of our data, for those persons whose second observations fall at a time after implementation of the minimum wage, this second observation may be straight after implementation or any time up to eight months after the minimum wage was introduced. In using a zero one type dummy variable to proxy the effect we are thus assuming that the impact would have been the same regardless of how long after implementation the second observation falls.

Given that other factors are important in determining an individual's wage rate and wage rate growth we control for the following worker characteristics, as available from the CSSP: *Male* is a zero-one type dummy indicating whether the individual is male, *AGE* is the individual's age for which we also allow for non-linearity by including its value squared, *Mar* is a marital status dummy variable, *NewW* is a dummy indicating whether the individual is a new entrant (having worked no more than six months since entry)[25], *University* is a zero one type dummy indicating whether the person's highest degree was a university degree, and *SecondaryO*, *SecondaryA* and *Primary* are all zero on type dummies indicating whether the highest completed level of schooling was secondary school O levels, secondary school A levels or primary school, respectively. Additionally

---

24 One should note that we are implicitly assuming that workers remained in the same job over the same period. Apart from checking the individual occupation and industrial code we were not able to directly investigate the validity of this assumption since the CSSP does not provide information on job tenure. However, using the occupaption and industry of the individual we found few to indicate any job changes as indicated by changes in these variables. Excluding observations on these did not alter our results in any significant manner.

25 Unfortunately our data set does not provide information on job tenure.

the following job characteristics were included: *UrbanW* is zero one type dummy indicating whether the person works in an urban area and *FSize* takes on the value of one if the firm at which the individual works has more than ten employees.

As noted earlier, Tybout (2000) makes a compelling case that the size of a firm is an important distinction in developing countries. One may thus expect that compliance to the minimum wage could be different across firm sizes. In order to investigate this we thus also included an interaction term, *MW*Fsize*, between our minimum wage and firm size dummies. In all specifications we also included one digit occupation and industry dummies and time, seasonal and regional dummies.

The results of our base specification of this probit model, where coefficients are reported as marginal effects, for male and female low wage workers are provided in Table 4. In the case of males we find that from the worker characteristics only age is a significant determinant of whether a low wage worker will be pushed up to at least the minimum level a year later. Specifically, younger low wage workers are less likely to experience a wage increase that would bring them above the TT$7.00 threshold, although this effect occurs at a decreasing rate. Whether the firm is located in an urban area or is a large firm are, on their own, not significant influences.

Most importantly, however, we find, as indicated by the significance of our interaction term between the firm size and minimum wage dummies, that the introduction of the national minimum wage acted to increase the likelihood of low wage male workers experiencing an increase in their wage rate to at least TT$7.00 – however, such compliance only occurred in large firms. Specifically, the coefficient implies that low wage males working in large firms are 18.7 per cent less likely to remain below the minimum wage level after introduction of the national minimum wage legislation. This appears to be a plausible result if indeed smaller firms, because many of them are operating outside the regulatory umbrella, are less likely to fear detection and thus less likely to practice compliance. Moreover, their potential costs were shown earlier to be substantially greater than for their large counterparts. It is also consistent with the

evidence from Figures 1 through 3 discussed above in that it was generally only in large firms that there was any noticeable compliance.[26]

For females we find that married low wage workers and those whose highest level of education was either primary or secondary (O Levels) are less likely to remain low wage workers. While workplace characteristics, as for males, do not on their own affect such wage growth, we find that the introduction of the national minimum wage acted to increase probability of receiving at least TT$7.00 by 20.5 per cent, regardless of whether the female was working in a large or small firm. It is surprising that the coefficient on the firm size interaction with the minimum wage dummy in the female regression is positive, although insignificant given that the kernel density estimates which show a large spike at the minimum wage for women in large firms and no effect for women in small firms. However, it should be pointed out that there are a number of weaknesses in this analysis. Firstly, the probits are conditional on the worker being employed before and after the minimum wage and thus do not account for the possibility that complying firms may reduce employment of low wage workers or increase employment of higher skill workers just above the minimum wage. Secondly, given the weaknesses in generating the hourly wage variable discussed above the dependent variable in the compliance probits may be sensitive to measurement error. The extent and impact of these factors possibly may differ across gender.[27]

VII THE EFFECT OF THE NATIONAL MINIMUM WAGE ON THE PROBABILITY OF JOB LOSS

Clearly one possible route with which firms may avoid at least some of the increase in wage costs due to compliance is to simply lay off or fire some or all of their low wage workers, thus decreasing the share of low wage workers in total employment and overstating, at least in aggregate, the degree of compliance. To investigate this we used the longitudinal nature of our data to model the probability of job loss in Trinidad and

---

26 In order to verify that our minimum wage dummy was not simply capturing overall wage growth in the last two quarters, we ran a regression of the determinants of wage growth for high wage workers and found that that the minimum wage dummy was insignificant in this specification.

27 On possibility is that using the midpoint of our hour categories as a proxy for the actual number of hours worked may be less appropriate for females. However, alternative hours definitions produced similar results – these are available upon request.

Tobago over our sample period in the spirit of Currie and Fallick (1996). Using the total linked worker sample we thus estimated the following for males and females:

Prob(JL) = f(X, Z, MW2)

where *JL* takes on the value of one if the individual lost his/her job, either due to layoff or being fired, a year later and zero otherwise[28], and the vectors *X* and *Z* are as defined above. Additionally, as in Currie and Fallick (1996), we included a variable *Bound*, taking on the value of one if the worker involved is a low wage worker (for the first observation) and his second observation falls after implementation of the minimum wage. Hence this variable is intended to control for a change in the probability of employment loss for those directly affected by the minimum wage, namely low wage workers who were employed prior to and whose second observation falls after implementation.

Two further points with regard to this variable are noteworthy. Firstly, given the lack of information on job tenure we are unable to distinguish those that may have suffered an involuntary job loss but, before the second interview, found alternative employment and those who remained in the same job unless there was a change in occupation and/or industry. As we noted earlier, there were few cases in which such classification changes were apparent from industry and occupation affiliation and exclusion of these did not alter our results. At any rate, this aspect of our data is likely to understate the impact of the minimum wage on job loss. Moreover, some of those who lost their job may have done so prior to the implementation of the minimum wage given the long time lag between interviews, namely a year. Using information on when the person last worked we thus excluded persons that had lost their job prior to April 1998.

Of course, in terms of the potential cost, the further the worker's wage is from the minimum level the more costly it will be for the employer to comply and hence the more likely the employer is to lay off or fire this worker relative to other low wage workers whose wage may be relatively higher, ceteris paribus. To allow for such differences in the impact of the minimum wage on job loss among low wage workers, we, like Currie and Fallick (1996), also experimented with another proxy, namely *Wagegap*. This variable takes on the absolute value of the difference between an individual's initial wage and TT$7.00 whenever Bound equals one, and zero otherwise, thus indicating the distance

---

28 Those that voluntarily left their job were excluded from the analysis.

between a low wage workers initial wage and the TT\$7.00. In order to allow for different effect across firm sizes both *Bound* and *Wagegap* were interacted with our firm size dummy variable. In all specifications we also controlled for seasonal and year specific effects.

Our results for male and female low wage workers are given in Table 8. In terms of our human capital control variables we find for males that only marital status and whether the worker's highest level of education was secondary A levels are significant factors, namely by reducing the probability of job loss. While whether a male works in an urban area does not significantly alter his probability of remaining in a job, clearly larger employers are less likely to lay off or fire their workers. The positive and significant sign on *Bound* suggests that the national minimum wage increased the probability of involuntary job loss among those directly affected, namely low wage workers, over the sample period. Specifically, a male working for less than the minimum level experienced a 9 per cent increase in the probability of being laid off or fired after implementation of the minimum wage. This also holds true when we allow for different effects among low wage workers, depending on their initial wage level, as shown by our alternative specification with *Wagegap*. The coefficients on the interaction of these variables with firm size and the minimum wage is insignificant, indicating that there was no differential impact across firms sizes.

For females we find that the more educated, regardless of which level, the less likely a female is to lose her job. Similar to males, those employed by large firms are less likely to be laid off or fired. In terms of the impact of the minimum wage we find that, unlike for males, for females only large firms were more likely to lay off/fire workers after the introduction of the minimum wage. One should note that this may provide one explanation as to why we do not find a differential impact across firm size in our model of compliance in the previous section, namely in that some larger firms responded to the minimum wage by laying off low wage female workers.

VIII   CONCLUDING REMARKS

In this paper we investigated the degree of compliance with a first time national minimum wage introduced in Trinidad and Tobago. We find that that the potential costs of full compliance were large. It is not surprising then that, given this and the fact that the

probability of detection of non-compliance and associated penalties appear to have been small, non-compliance was in reality high - around 33 percent even six months after implementation. An issue that has recently been prevalent in the literature is the possibility that regulation may hinder some firms from reaching their optimal size by creating the incentive to remain small in order to be unregulated, leading to a "missing middle" in the firm size distribution, see Tybout (2000) for a discussion. Our results also suggest that firm size, possibly indicative of the 'formality' of the firm or its ability to remain outside the regulatory umbrella, is an important determinant in matters of compliance.

Although overall compliance is found to be low, our micro-level evidence indicates that the minimum wage was still binding for some workers. Males working in large firms tended to have their wage increased to at least the minimum level, while both large and small employers in some cases responded to the minimum wage by laying off workers. Although an examination of the wage distribution suggests that for females, as for males, that compliance generally only took place in large firms, our study of the individual level suggests that some females in both large and small firms experienced a wage increase due the minimum wage. This discrepancy can be, at least in part, reconciled with the fact that we find that larger employers responded to the minimum wage by laying off the directly affected female workers.

REFERENCES

Bell, L. (1994). "The Impact of Minimum Wages in Mexico and Columbia", Policy Research Working Paper 1514, World Bank, Washington, DC.

Bell, L. (1997). "The Impact of Minimum Wages in Mexico and Columbia", *The Journal of Labor Economics*, 15, pp. S102-S105.

Brown, Charles (1999). "Minimum Wages, Employment, and the Distribution of Income", *The Handbook of Labor Economics* Vol. 3B, eds. Ashenfelter, O. and Card, D., Elsevier Press, Amsterdam.

Card. D. (1991). "Do Minimum Wages Reduce Employment? A Case Study of California: 1978-1989", NBER Working Paper 3710, NBER, Cambridge, Massachusetts.

Card, D. and Krueger, A. (1995). *Myth and Measurement: The New Economics of the Minimum Wage*, Princeton University Press, 1995

Currie, J. and Fallick, B. (1996). "The Minimum Wage and the Employment by Youth", *Journal of Human Resources*, 31, pp. 404-428.

DiNardo, J., Fortin, N. And Lemieux, T. (1996). "Labor Market Institutions and the Distributions of Wages, 1973-1992: A Semi-Parametric Approach", *Econometrica*, pp. 1001-1044.

Harrison, A. (1993). "Morocco Private Sector Assessment: The Labor Market, 1993", World Bank Research Department, mimeo.

Harrison, A. and Leamer, E. (1997). "Labor Markets in Developing Countries: An Agenda for Research", *Journal of Labor Economics*, 15, pp. S1-S19.

Jones, P. (1998). "The Impact of Minimum Wage Legislation in Developing Countries where Coverage is Incomplete", CSAE Working Paper WPS 98.2, University of Oxford, Oxford.

Lustig, N. and McLeod D. (1997): "Minimum wages and poverty in developing countries: Some empirical evidence", *Labour Markets in Latin America*, Edwards S. & N. C. Lustig (Eds), pp 62-103, The Brookings Institution Press, Washington DC.

Madrian, B. and Lefgren, L. (1999). "A Note on Longitudinally Matched CPS Respondents", NBER Working Paper T0247, NBER, Cambridge, Massachusetts.

Meyer, R. and Wise, D.,(1983) "Discontinuous Distributions and Missing Persons: The Minimum Wage and Unemployed Youth" Econometrica 61,1677-1698

Morrisson, C. (1993). "Le Probleme de Bas Salaries et du Salarie Minimum dans les pais en developpment", OECD, mimeo.

Rama, M. (1996). "The Consequences of Doubling the Minimum Wage: The Case of Indonesia", mimeo, The World Bank.

Rambarran, A. (1998). "Labour Market Adjustment in an Oil-Based Economy: The Experience of Trinidad and Tobago", in

Squire, L. and Suthiwart-Narueput, S. (1997). "The Impact of Labor Market Regulations", *World Bank Economic Review*, 11, pp. 119-143.

Tybout, J. (2000). "Manufacturing Firms in Developing Countries: How Well Do They DO, and Why?", *Journal of Economic Literature*, 38, pp. 11-44.

Appendix   Tables and Figures

Table 1   Minimum Wages for Industries prior to the National Minimum Wage Act

SECURITY INDUSTRY

Category	Hourly rates, full-time empl.
Canine security officer	TT $ 6.00
Unprecepted security guard	5.50
handler	5.30
Secretary	5.63
k/typist	5.38
Receptionist	5.00
Clerical worker	5.00
Telephone operator	4.88
	-

CATERING INDUSTRY

Category	Weekly wages, full-time work.
Bartender	TT $ 220.00
Cashier	210.00
Chambermaid	185.00
Cleaner	185.00
Clerical worker	215.00
Clerk/typist	215.00
Cook	235.00
Counter attendant	185.00
Driver	225.00
Electrician	275.00
Elevator operator	185.00
Gardener	185.00
Grill worker	195.00
Handyman	185.00
Head Cook	285.00
Head Waiter	285.00
Housekeeper	285.00
Kitchen Assistant/Asst. cook	195.00
Launderer/Washer	185.00
Maintenance worker/Skilled tradesman	260.00
Messenger	185.00
Porter/Bell-boy	185.00
Potwasher/Dishwasher	185.00
Reservations clerk/Receptionist	225.00
Secretary	225.00
Storekeeper	250.00
Supervisor	280.00
Swimming pool attendant	185.00
Telephone operator	215.00
Waiter/Waitress/Hostess	190.00
Watchman/Caretaker	185.00
	-

RETAIL INDUSTRY

Category	Weekly wages, full-time work.
Supervisor	TT $ 280.00
Window dresser	225.00
Driver/loader	225.00
Messenger/driver	225.00

Clerical worker	200.00
Telephone operator	195.00
Cashier	210.00
Sales clerk	200.00
Loader/porter	190.00
Stock replenisher	190.00
Wrapper	185.00
Messenger	185.00
.ner	185.00
Receptionist	200.00

DOMESTIC SERVICE INDUSTRY

Full-time household assistant	TT $ 150.00 per week
Part-time household assistant	TT $ 3.75 per hour

Table 2   Potential Costs in Aggregate

	% of Total Empl.	% Low Wage Empl.	Potential Cost
Total	100.0	35.6	6.4
Male (Large)	41.3	14.7	1.4
Male(Small)	23.8	56.4	9.3
Female(Large)	21.3	24.9	3.3
Female(Small)	13.5	79.9	23.8

Table 3   Potential Costs By Broad Industry Group

	% of Total Empl.	% Low Wage Empl.	Potential Cost
Agriculture, Hunting, Forestry & Fishing	7.0	54.8	19.1
Mining & Quarrying	2.5	4.7	0.2
Manufacturing	11.9	32.1	5.1
Electricity, Gas & Water	1.5	1.1	0.1
Construction	12.3	22.7	3.0
Wholesale & Retail Trade, Restaurants & Hotels	19.0	65.0	17.3
Transport Storage & Communication	7.2	21.7	2.2
Financing, Insurance, & Real Estate	8.6	15.7	1.4
Community, Social & Personal Services	30.0	32.8	6.2

Table 4: Probit Model of Compliance

	Males	Females
MW	-0.107	0.205
	(0.251)	(0.028)
Age	0.053	-0.011
	(0.000)	(0.279)
Age^2	-0.001	-0.000
	(0.000)	(0.284)
Mar	0.031	0.170
	(0.642)	(0.003)
Primary	0.086	0.112
	(0.163)	(0.082)
SecondaryA	0.079	0.139
	(0.298)	(0.069)
SecondaryO	Dropped	0.385
		(0.175)
University	Dropped	Dropped
UrbanW	0.044	0.010
	(0.349)	(0.835)
Fsize	-0.023	0.073
	(0.694)	(0.25)
MW*Fsize	0.187	-0.116
	(0.045)	(0.186)
Pseudo R^2	0.09	0.07
X^2-statistic	71.77	48.22
Observations	584	527

Notes:
1. Coefficients reported as marginal effects
2. All regressions include industry, occupation, regional seasonal, and year dummies
3. P values given in parentheses.

Table 5: Probit Model of Job Loss

	Males		Females	
Bound	0.090	---	0.023	---
	(0.017)		(0.598)	
Bound*Fsize	0.012	---	0.119	---
	(0.764)		(0.084)	
Wagegap	---	0.023	---	0.020
		(0.018)		(0.139)
Wagegap*Fsize	---	0.024	---	0.037
		(0.124)		(0.058)
Age	-0.005	-0.004	0.006	0.007
	(0.142)	(0.243)	(0.419)	(0.307)
Age^2	0.000	0.000	-0.000	-0.000
	(0.301)	(0.440)	(0.000)	(0.118)
Mar	-0.067	-0.065	-0.021	-0.020
	(0.000)	(0.000)	(0.442)	(0.451)
Primary	-0.028	-0.027	-0.066	-0.073
	(0.191)	(0.221)	(0.037)	(0.018)
SecondaryA	-0.046	-0.044	-0.097	-0.101
	(0.251)	(0.064)	(0.016)	(0.011)
SecondaryO	-0.053	-0.053	-0.097	-0.095
	(0.331)	(0.338)	(0.041)	(0.048)
University	---	---	---	---
UrbanW	0.009	0.009	-0.000	0.004
	(0.573)	(0.531)	(0.990)	(0.871)
Fsize	-0.043	-0.053	-0.104	-0.098
	(0.034)	(0.007)	(0.002)	(0.002)
Nobs.	1287.00	1287.00	695.00	695.00
F-Test	154.63	159.56	107.16	113.57
R^2	0.16	0.17	0.18	0.19

Notes:
1. Coefficients reported as marginal effects
2. All regressions include industry, occupation, regional, seasonal, and year dummies
3. P values given in parenthesis.

Figure 1: Proportion of Low Wage Workers by Gender and Firm Size

NoteNtoe
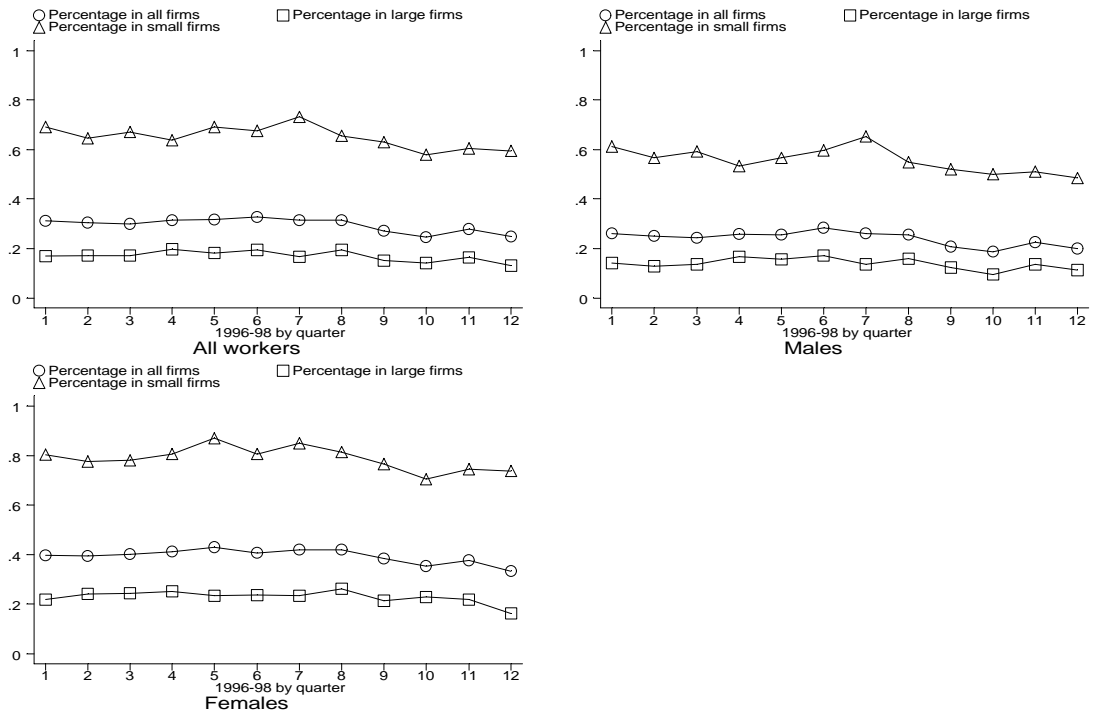
Notes: Sample 1-4: 1996; Sample 5-8: 1997; Sample 9-12: 1998

**Figure 2: Average Gap between Wage Rate and Minimum Level for Low Wage
Workers by Gender and Firm Size**
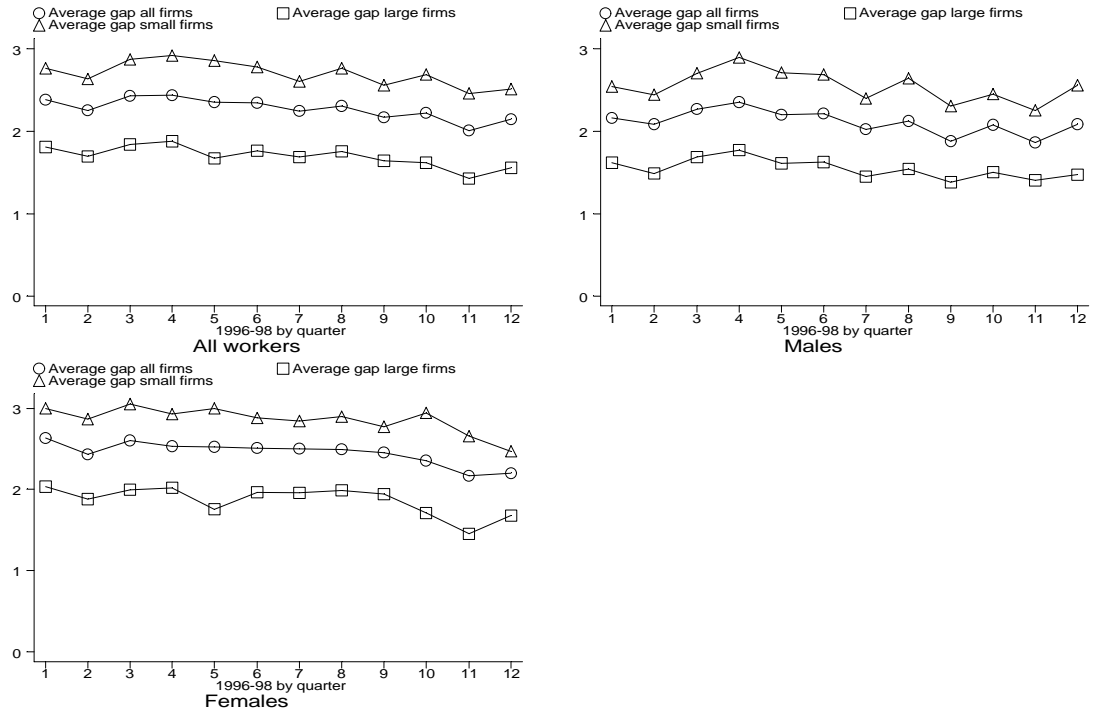
Notes: Sample 1-4: 1996; Sample 5-8: 1997; Sample 9-12: 1998

Figure 3: Kernel Density Estimates of Total Real Hourly Wage Rate Distribution

All Workers

All Workers
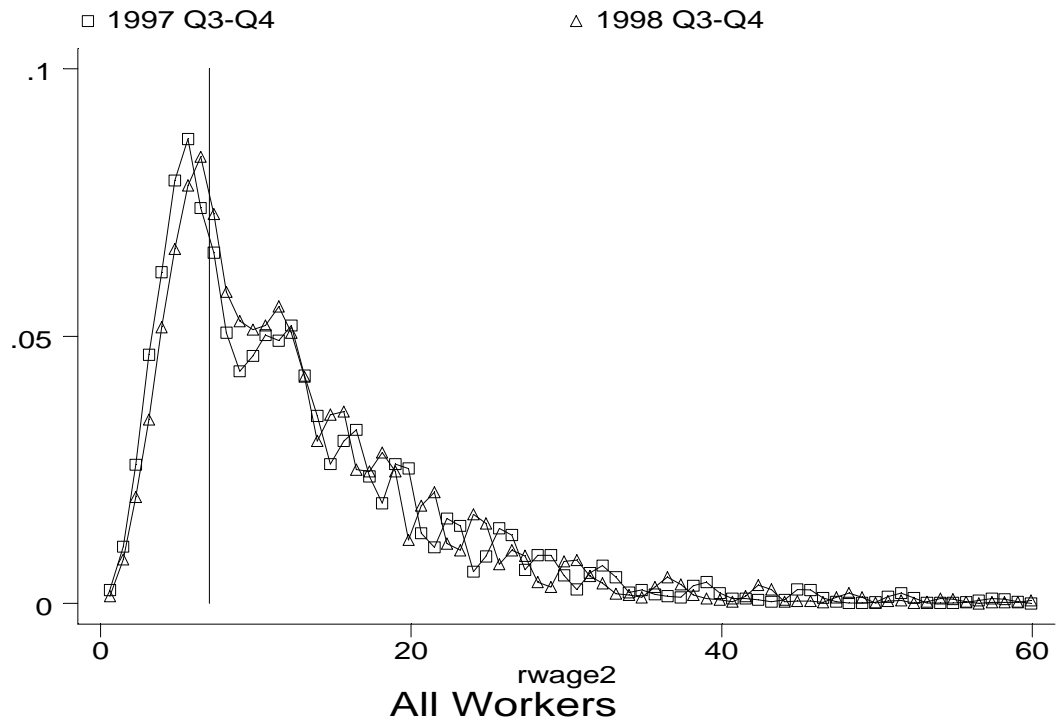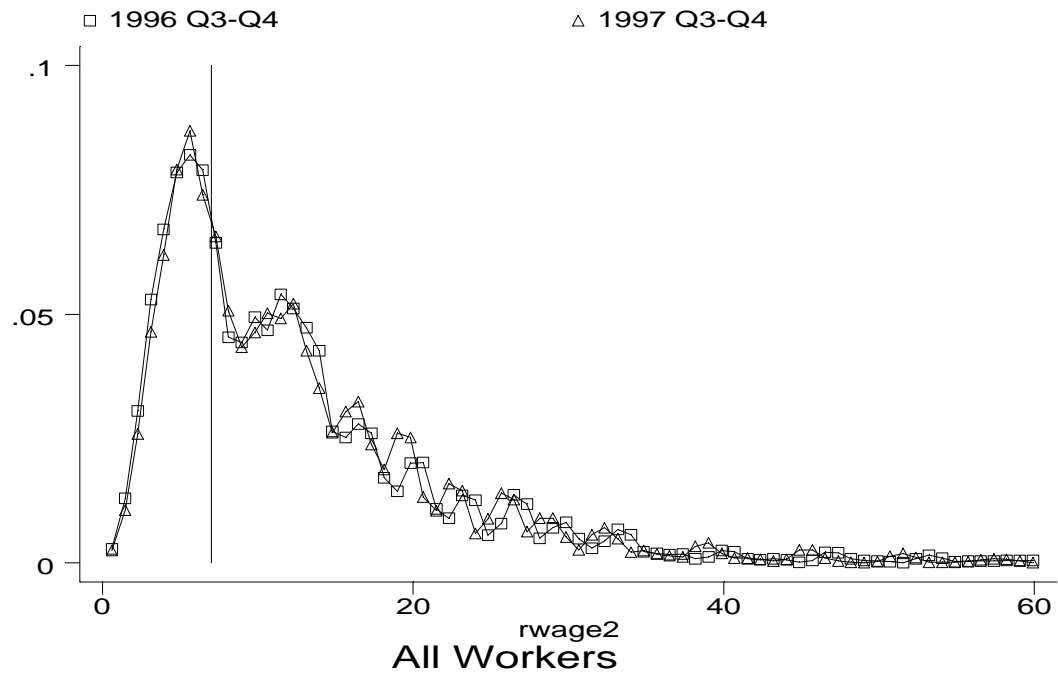
Figure 4: Kernel Density Estimates of Male Real Hourly Wage Rate Distribution in Total and by Firm Size

Large Firms Males

Small Firms Males
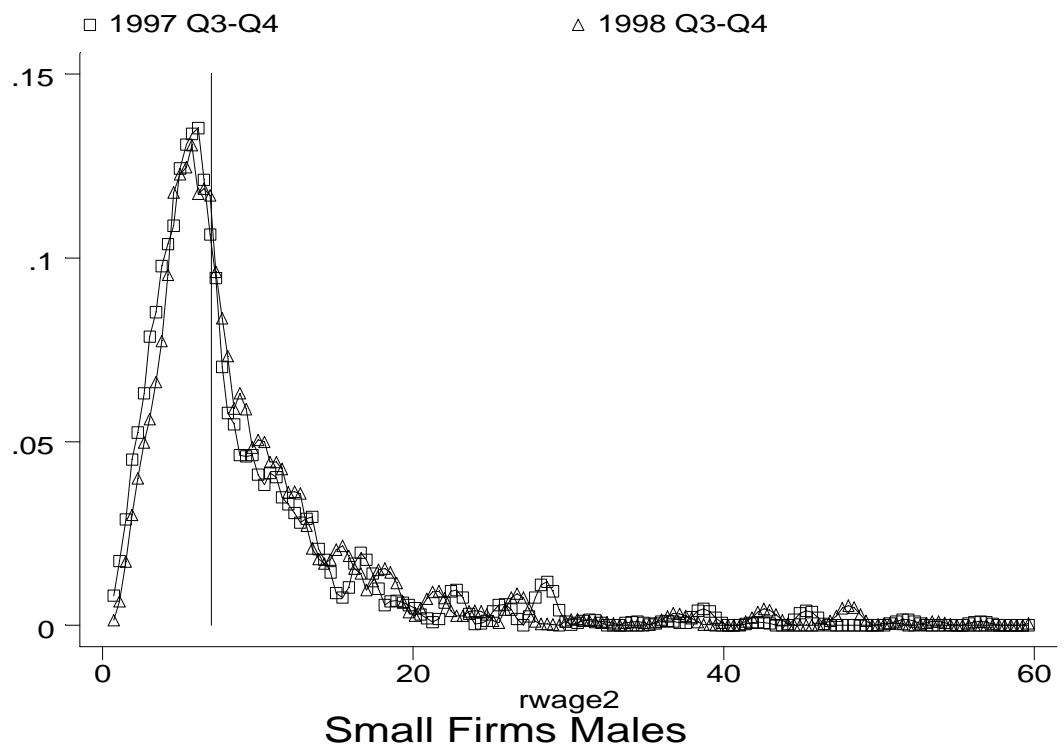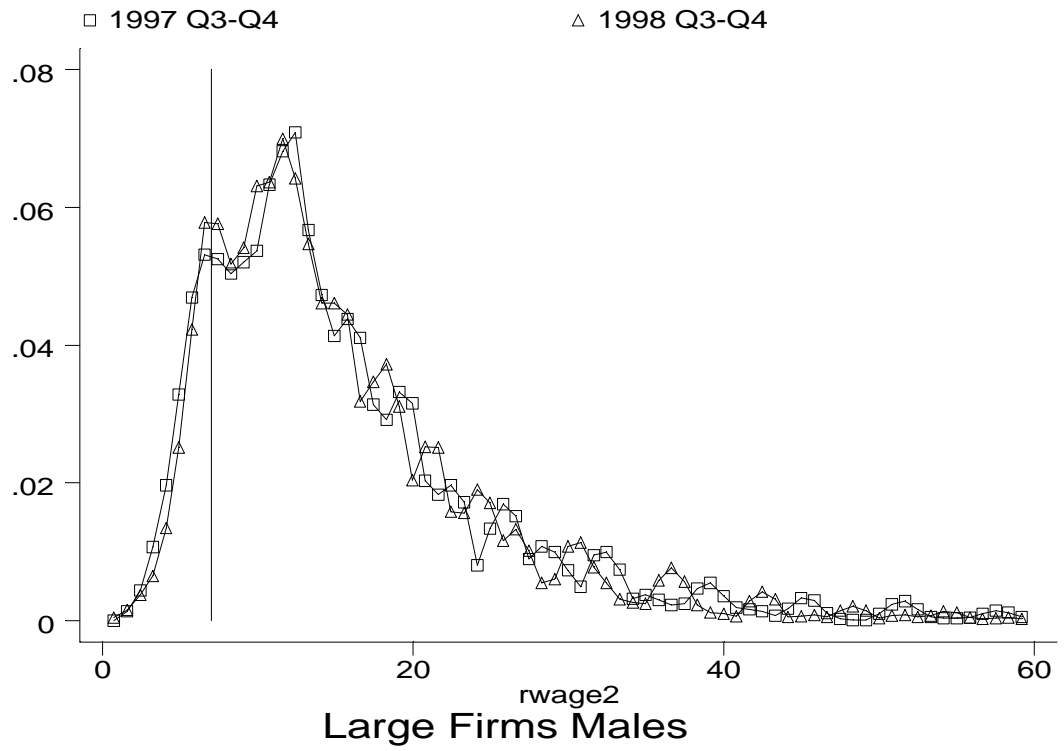
Figure 5: Kernel Density Estimates of Female Real Hourly Wage Rate Distribution in Total and by Firm Size

Large Firms Females

Small Firms Females
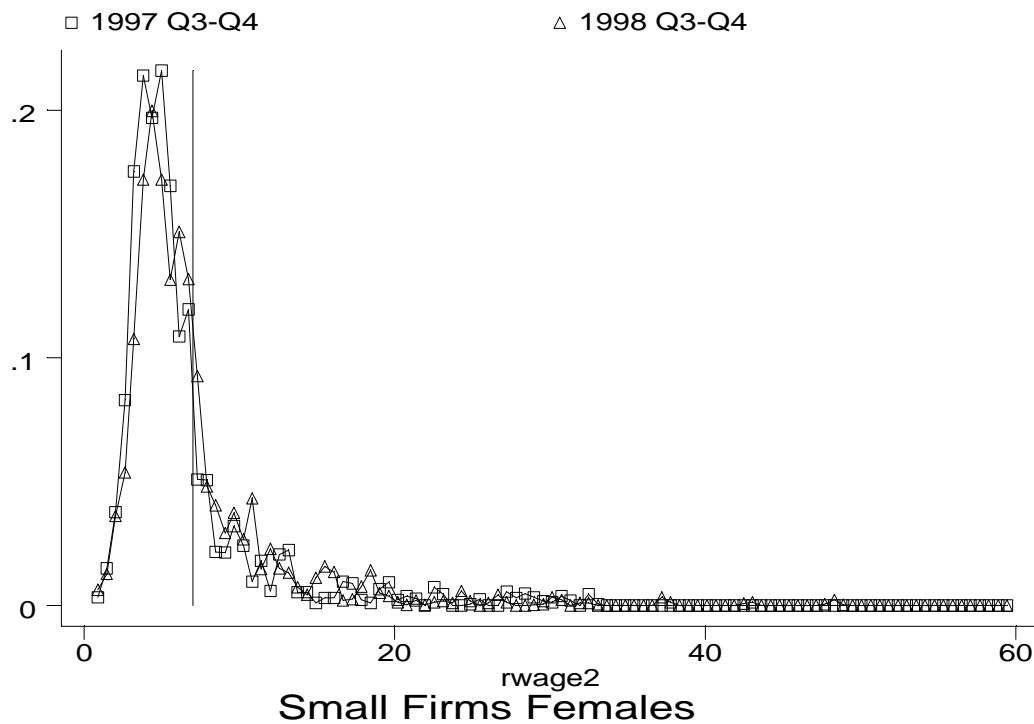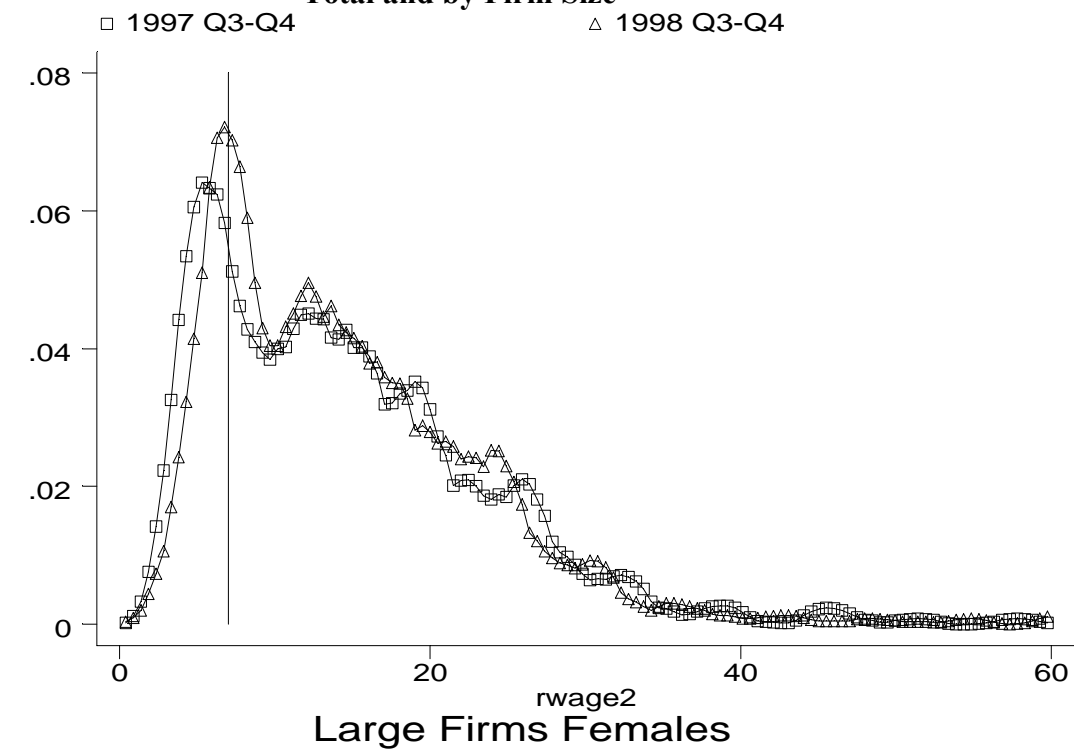
CREDIT PAPERS

99/1   **Ewen Cummins,** "Hey and Orme go to Gara Godo: Household Risk Preferences"

99/2   **Louise Grenier, Andrew McKay and Oliver Morrissey,** "Competition and Business Confidence in Manufacturing Enterprises in Tanzania"

99/3   **Robert Lensink and Oliver Morrissey,** "Uncertainty of Aid Inflows and the Aid-Growth Relationship"

99/4   **Michael Bleaney and David Fielding,** "Exchange Rate Regimes, Inflation and Output Volatility in Developing Countries"

99/5   **Indraneel Dasgupta,** "Women's Employment, Intra-Household Bargaining and Distribution: A Two-Sector Analysis"

99/6   **Robert Lensink and Howard White,** "Is there an Aid Laffer Curve?"

99/7   **David Fielding,** "Income Inequality and Economic Development: A Structural Model"

99/8   **Christophe Muller,** "The Spatial Association of Price Indices and Living Standards"

99/9   **Christophe Muller,** "The Measurement of Poverty with Geographical and Intertemporal Price Dispersion"

99/10 **Henrik Hansen and Finn Tarp,** "Aid Effectiveness Disputed"

99/11 **Christophe Muller,** "Censored Quantile Regressions of Poverty in Rwanda"

99/12 **Michael Bleaney, Paul Mizen and Lesedi Senatla,** "Portfolio Capital Flows to Emerging Markets"

99/13 **Christophe Muller,** "The Relative Prevalence of Diseases in a Population of Ill Persons"

00/1   **Robert Lensink,** "Does Financial Development Mitigate Negative Effects of Policy Uncertainty on Economic Growth?"

00/2   **Oliver Morrissey,** "Investment and Competition Policy in Developing Countries: Implications of and for the WTO"

00/3   **Jo-Ann Crawford and Sam Laird,** "Regional Trade Agreements and the WTO"

00/4   **Sam Laird,** "Multilateral Market Access Negotiations in Goods and Services"

00/5   **Sam Laird,** "The WTO Agenda and the Developing Countries"

00/6   **Josaphat P. Kweka and Oliver Morrissey,** "Government Spending and Economic Growth in Tanzania, 1965-1996"

00/7   **Henrik Hansen and Fin Tarp,** "Aid and Growth Regressions"

00/8   **Andrew McKay, Chris Milner and Oliver Morrissey,** "The Trade and Welfare Effects of a Regional Economic Partnership Agreement"

00/9   **Mark McGillivray and Oliver Morrissey,** "Aid Illusion and Public Sector Fiscal Behaviour"

00/10 **C.W. Morgan,** "Commodity Futures Markets in LDCs: A Review and Prospects"

00/11 **Michael Bleaney and Akira Nishiyama,** "Explaining Growth: A Contest between Models"

00/12 **Christophe Muller,** "Do Agricultural Outputs of Autarkic Peasants Affect Their Health and Nutrition? Evidence from Rwanda"

DEPARTMENT OF ECONOMICS DISCUSSION PAPERS

In addition to the CREDIT series of research papers the School of Economics produces a discussion paper series dealing with more general aspects of economics. Below is a list of recent titles published in this series.

99/23 **Yongsheng Xu,** "No-Envy and Equality of Economic Opportunity"

99/24 **M. Conyon, S. Girma, S. Thompson and P. Wright,** "The Impact of Mergers and Acquisitions on Profits and Employee Remuneration in the United Kingdom"

99/25 **Robert Breunig and Indraneel Dasgupta,** "Towards an Explanation of the Cash-Out Puzzle in the US Food Stamps Program"

99/26 **John Creedy and Norman Gemmell,** "The Built-In Flexibility of Consumption Taxes"

99/27 **Richard Disney,** "Declining Public Pensions in an Era of Demographic Ageing: Will Private Provision Fill the Gap?"

99/28 **Indraneel Dasgupta,** "Welfare Analysis in a Cournot Game with a Public Good"

99/29 **Taradas Bandyopadhyay, Indraneel Dasgupta and Prasanta K. Pattanaik,** "A Stochastic Generalization of the Revealed Preference Approach to the Theory of Consumers' Behavior"

99/30 **Charles Blackorby, WalterBossert and David Donaldson,** "Utilitarianism and the Theory of Justice"

99/31 **Mariam Camarero and Javier Ordóñez,** "Who is Ruling Europe? Empirical Evidence on the German Dominance Hypothesis"

99/32 **Christophe Muller,** "The Watts' Poverty Index with Explicit Price Variability"

99/33 **Paul Newbold, Tony Rayner, Christine Ennew and Emanuela Marrocu,** "Testing Seasonality and Efficiency in Commodity Futures Markets"

99/34 **Paul Newbold, Tony Rayner, Christine Ennew and Emanuela Marrocu,** "Futures Markets Efficiency: Evidence from Unevenly Spaced Contracts"

99/35 **Ciaran O Neill and Zoe Phillips,** "An Application of the Hedonic Pricing Technique to Cigarettes in the United Kingdom"

99/36 **Christophe Muller,** "The Properties of the Watts' Poverty Index Under Lognormality"

99/37 **Tae-Hwan Kim, Stephen J. Leybourne and Paul Newbold,** "Spurious Rejections by Perron Tests in the Presence of a Misplaced or Second Break Under the Null"

00/1 **Tae-Hwan Kim and Christophe Muller,** "Two-Stage Quantile Regression"

00/2 **Spiros Bougheas, Panicos O. Demetrides and Edgar L.W. Morgenroth,** "International Aspects of Public Infrastructure Investment"

00/3 **Michael Bleaney,** "Inflation as Taxation: Theory and Evidence"

00/4 **Michael Bleaney,** "Financial Fragility and Currency Crises"

00/5 **Sourafel Girma,** "A Quasi-Differencing Approach to Dynamic Modelling from a Time Series of Independent Cross Sections"

00/6 **Spiros Bougheas and Paul Downward,** "The Economics of Professional Sports Leagues: A Bargaining Approach"

00/7 **Marta Aloi, Hans Jørgen Jacobsen and Teresa Lloyd-Braga,** "Endogenous Business Cycles and Stabilization Policies"

00/8 **A. Ghoshray, T.A. Lloyd and A.J. Rayner,** "EU Wheat Prices and its Relation with Other Major Wheat Export Prices"

Members of the Centre

Director

Oliver Morrissey - aid policy, trade and agriculture

Research Fellows (Internal)

Simon Appleton – poverty, education, households
Adam Blake   CGE models of low-income countries
Mike Bleaney - growth, international macroeconomics
Indraneel Dasgupta – development theory
Norman Gemmell – growth and public sector issues
Ken Ingersent - agricultural trade
Tim Lloyd   agricultural commodity markets
Paula Lorgelly – health, gender and growth
Andrew McKay - poverty, peasant households, agriculture
Chris Milner - trade and development
Wyn Morgan - futures markets, commodity markets
Christophe Muller – poverty, household panel econometrics
Tony Rayner - agricultural policy and trade

Research Fellows (External)

V.N. Balasubramanyam (*University of Lancaster*) – foreign direct investment and
                                                multinationals
David Fielding *(Leicester University)* - investment, monetary and fiscal policy
Göte Hansson (*Lund University*) – trade, Ethiopian development
Robert Lensink *(University of Groningen)* – aid, investment, macroeconomics
Scott McDonald *(Sheffield University)* – CGE modelling, agriculture
Mark McGillivray *(RMIT University)* - aid allocation, human development
Jay Menon *(ADB, Manila)* - trade and exchange rates
Doug Nelson *(Tulane University)* - political economy of trade
Shelton Nicholls *(University of West Indies)* – trade, integration
David Sapsford (*University of Lancaster*) - commodity prices
Eric Strobl *(University College Dublin)* – labour markets
Finn Tarp *(University of Copenhagen)* – aid, CGE modelling
Howard White *(IDS)* - aid, poverty