Discussion Papers in Economics

LABOUR MARKET AND INVESTMENT EFFECTS OF
REMITTANCES

By
Stephen Drinkwater
(University of Surrey)

Paul Levine
(University of Surrey)

&

Emanuela Lotti
(University of Surrey)

DP 19/06

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Stephen Drinkwater   Paul Levine   Emanuela Lotti

University of Surrey

October 31, 2006

Abstract

This paper examines the relationship between remittances from international migration and imperfections in labour and capital markets. We use a search-matching model of the labour market to show that remittances can have two opposing effects on the labour market of the source country. First, they raise the utility of the unemployed members back home and, if a worker's bargaining power is low, this causes the unemployment rate to rise. Second, remittances available for investment will relax credit constraints encountered by firms. If the 'investment effect' outweighs the 'search income' effect, then remittances will reduce the unemployment rate. Our empirical analysis suggests that remittances have a small negative effect on unemployment, but a positive and significant effect on investment.

JEL Classification: F22, F43

Keywords: migration, remittances, capital constraints.

Contents

1 Introduction

The economic analysis of the effects of remittances has become an increasingly important issue in recent years because of the rapid growth of this form of financial flow. Official estimates put global remittances at around \$80bn in 2002, but the total amount, which includes flows through unofficial channels, is thought to be far greater than this. Nevertheless, the official level of remittances greatly exceeds the amount received in overseas aid by developing countries. Remittances are particularly important to some countries, with remittances in our sample of 19 lower and middle income countries equal to 3.8% of GDP.

The purpose of this paper is to shed light on the relationship between remittances from international migration and imperfections in the labour and capital markets of the sending countries. Different forces can affect the way labour markets perform, especially when migration occurs between countries at different stages of development. Migration can affect the labour market of the origin country through at least two channels. First, migration opportunities can influence the education decision of both migrants and stayers (Stark et al., 1998). Second, when migrants remit part of their earning to their families, they can affect the consumption, investment and employment decisions of stayers. The latter is the focus of this paper. We develop a search- matching model to analyse the role of migration opportunities and remittances on the labour market performance of the home country.

The basic idea of the paper is that migration opportunities can have two opposing effects on the source country's labour market. First, remittances from migrants to their family raise the income of the unemployed individuals back home. As a consequence, the outside option for the unemployed improves, causing the unemployment rate to *increase*. But suppose some remittances are invested. The net effect of remittances in the labour market of the home country is then far from obvious. In particular, we show that when firms are financially constrained, remittances can *decrease* the unemployment rate in the home labour market.

Firms in developing country often cite credit constraints as a major obstacles

to business. Batra et al. (2002) summarise the results of a survey of more than 10,000 firms in 80 countries, carried out between late 1999 and mid 2000 on the types of constraints they faced. They report *"firms in Central and Eastern Europe are most likely to identify financing as a serious constraint, followed by those in CIS (former Soviet Union) countries, and then those in Africa, South Asia, and Latin America"*(p. vi). The constraint is particularly important for small and medium size firms. The authors add *"It is not surprising that whereas 50 per cent of firms in all developing regions cited financing as a serious constraints, only 40 per cent of firms in OECD countries found it to be so"*. Clearly the lack of funds for investment influences the process of economic development, and remittances are a possible way of relaxing these constraints.[1] We therefore develop a dynamic labour matching model with capital and credit constraints. This gives us a useful theoretical framework to discriminate between the 'productive' and 'unproductive' uses of remittances.

The paper is organized in the following way. Section 2 provides an overview of the existing theoretical and empirical literature on the effects of migration on the welfare of stayers. Section 3 introduces the basic model in which we explore the effect of remittances on labour markets where firms' level of investments are sub-optimal owing to credit constraints. Section 4 provides an empirical analysis of the relationship between remittances and unemployment as well as with investment and section 5 concludes.

2   Related Literature

A large literature has developed in recent years concerning the impact of international migration on both the home and host countries. Apart from a few exceptions (e.g. Davis and Weinstein, 2002), the general perception is that migration enhances

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[1]Foreign direct investment (FDI) is another possible way of relaxing credit constraints. However Harrison and MacMillan (2001), using firm level data from the Ivory Coast, show that borrowing by foreign firms can have a negative effect on the credit constraints of domestic firms.

the welfare of people living in the host country even if distributional effects can be important. For example, Borjas (1995) summarises this literature and reports that immigration increases national income but only results in a small negative impact on native wages and employment.

However, the analysis of the effects of migration is far from complete if we do not take into account the effects of migration on the home (sending country's) labour market. Given that it is often the most skilled individuals who migrate, the most obvious effect of migration from Less Developed Countries (LDCs) is that a brain drain could negatively affect the labour market of the labour exporting country, although some recent studies argue that the brain drain need not harm LDCs (Stark et al., 1998; Beine et al., 2001). For the remainder of this section, however, we will focus on literature that examines the effects of remittances.

First we relate our theoretical model to what has been found empirically. Income from remittances or from return migrants[2] can be spent on durable and non-durable goods or can be used in a productive way through direct investment in a project or through savings channeled from the banking system. A number of studies have examined the two effects of remittances on employment and investment, although the analysis usually relates to only a single country.

Funkhauser (1992) notes that migration and remittances can have two effects on participation decisions on the home country's labour market. The loss of the migrant worker may mean that other household members, in particular females, enter the labour market. However, the receipt of remittances could reduce participation rates because of the income effect. He further suggests that high levels of remittance flows into local labour markets may increase aggregate demand and hence the demand for labour. Using data from El Salvador, he finds that remittances have a negative and

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[2]As clarified in Rapoport and Docquier (2005): "At a macro level, there are only minor differences between remittances *stricto sensu* and repatriated savings upon return...... . The relevant questions are: How much income earned abroad is repatriated? And are the amounts repatriated being used for investment or consumption?" Therefore, we use the term "remittances" to cover both sources of income.

significant influence on the labour force participation of both males and females. However, he finds that the loss of migrants does not have a significant effect on local labour markets. For females the positive but small effect of the local labour market is enough to outweigh the negative remittance effect, but for males, the negative income effect from remittances dominates all other effects.

Further evidence that remittances act in a similar way to welfare payments is provided by Zachariah et al. (2001). They report that the worker-population ratio was 55% amongst non-migrant households in Kerala, India but only 32% in households with an emigrant. They suggest that this finding may be caused by employment seekers from emigrant households being more selective with regards to their job match. Furthermore, they report unemployment rates of 21% and 8% for emigrant and non-emigrant households respectively. They conclude their section on the effect of migration on employment and unemployment with the comment *"because unemployed persons belonging to emigrant households enjoy the financial support of the emigrant members, they are not in any hurry to get employed"* (p. 55).

The idea that unemployment benefits act as a safety net for the unemployed worker is theoretically explained in Marimon and Zilibotti (1999). They develop an equilibrium search matching model with two-sided and ex ante heterogeneity to obtain a distribution of match productivities. An increase in unemployment benefits acts as a safety net and the unemployed wait longer for better matches. They find that in an economy with higher unemployment benefits there will be a higher unemployment rate but also a better allocation of skills to jobs.

In terms of the non-productive versus productive use of remittances, Durand et al. (1996) report that 10% of their sample of Mexican migrants to the US who reported that they sent remittances or brought savings back with them spent at least some of the migrodollars (saved/remitted) productively. 14% reported that they spent some of their migradollars on housing and the remaining 76% reported that they spent the migradollars only on consumption. Glytsos (1993) estimates that only

4% of the estimated 14 billion drachmas sent migrant remittances to Greece in 1971 was invested in machinery and another 4% was invested in small shops, compared with 63% on consumption, 22% on housing and 7% on land. Using input-output analysis, he estimates that the multiplier effect associated with migrant remittances is 1.7 and this is found to vary between industries. The author also estimates the potential employment and capital effects of remittances amounted to around 74,000 new non-agricultural and non-public sector jobs and 8% of installed manufacturing capacity.

Adams (1998) also finds that external remittances have an important impact on the accumulation of rural assets using Pakistani data and argues that the marginal propensity to invest transitory income is higher than it is for labour income[3]. Rozelle et al. (1999) find that remittances help to loosen the constraints on crop production in rural China and also stimulate productivity. Furthermore, given that many LDCs are likely to face capital and liquidity constraints, these constraints can be eased as a result of the savings that are deposited by migrants or their families. Therefore despite the fact that only a small proportion of remittances may be invested directly by migrants or their families, remittances can be channeled into productive uses by the banking system.

Kule et al. (2002), summarise the results of two surveys carried out in Albania in 1998, one directed at individuals and another at firms. It is found that over 50% of the remittances sent to Albania were used for consumption, 16% were saved in a bank, 7% were invested both in financial institutions and in property, and over 7% invested in business, while firms indicated that around 17% of the capital required to establish a business came from remittances. This evidence suggests that remittances can been seen as a way to overcome credit-constraints in the source economy[4].

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[3]He also finds that remittances from international migration have a much larger impact on the accumulation of physical assets (irrigated and rain-fed land) than remittances from internal migration.

[4]There is also evidence to indicate that remittances increase human as well as physical capital levels (Cox Edwards and Ureta, 2003; Lopez Cordova, 2004).

Leon-Ledesma and Piracha (2004) also adopt a positive view of the relationship between migration and development by modeling the effects of short term migration on labour productivity. Remittances can be channeled into investments and increase productivity in the home economy. The authors study the impact of migration and remittances on the employment performance of Central and Eastern European Countries and claim that the main sources of migrant savings from overseas are used productively in the home country.

Finally, this issue can also be related to the literature that explores the role of foreign aid as an instrument for financing investment. The links between aid and investment are quite complex. On the one hand, foreign aid finances investment in public infrastructure which can have a positive effect on private investments (Chatterjee and Turnovsky, 2005). On the other hand, aid can have an adverse impact on domestic savings and investment (Cassen, 1986). Dollar and Easterly (1999), in a study on African countries on the links between aid, investment and growth, find that only 8 countries show a positive and significant relationship between aid and investment, while there is a negative and significant relationship in 12 countries.

To the best of our knowledge, the literature on matching theory has been silent until now on the role of migration opportunities on the labour market performance of the home country. In section 3.1 we build on Pissarides' basic model with capital. Pissarides (2000) assumes perfect capital markets and shows that the standard unemployment model is unaffected by the introduction of capital. Firms choose the optimal level of investment and the introduction of new savings in the economy does not have any effect on the output produced by each firm. In our model, we assume that individuals are risk-averse. Moreover, the introduction of credit constraints generates new effects and creates a link between the literature on matching theory and the one that investigates the effects of remittances on labour exporting counties.

3 The Model: Remittances with Credit-Constrained Firms

3.1 The Basic Model with the Capital Stock

Consider a worker living in a country characterized by unemployment owing to search frictions in the labour market. The worker has the option to migrate and earn a safe return abroad which we assume is given. We do not model the migration decision of individuals and assume that a fixed proportion of individuals migrate and remit back home[5]. These savings are used by the return migrant to increase his expected lifetime utility in his own country. Alternatively, we can think of a permanent migrant who remits his savings to the members of the family that decide to stay in the home country[6].

In a world with frictions it takes time to find a job. Trade is a decentralized economic activity and coordination failures together with imperfect information are essential elements of the trading process. The technology of meeting is summarized by a matching function which gives the number of matches in the economy as a function of inputs (i.e. the number of buyers and sellers). Matching functions reflect the fact that trading partners are not fully informed of each others' existence because of horizontal heterogeneity in location, sectors of activity and type of skills. Rationing arises in a world where individuals are imperfectly aware of their economic opportunities from the stochastic nature of the matching process between partners.

The number of job meetings and matches is synthesized by the following matching function[7]: $m(u; v)$ where u is the unemployment rate and v the vacancy rate.

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[5]It is beyond the scope of this paper to model the migration decision. In fact, the evidence shows that part of the income earned abroad is repatriated in the home economy and that the decision to remit is driven by different motives. See Rapoport and Docquier (2005) for a detailed survey on the motives to remit.

[6]See the previous section for the definition of repatriated income earned abroad.

[7]The matching function is a technical device that captures the frictions of the economy. It is possible to derive it from particular specifications of the meeting process.

This function is assumed increasing in both arguments and concave. For simplicity, we assume that the dimension of the market does not affect its performance, namely the function is homogeneous of degree one. Under this assumption, the probability of finding a match will be a function only of the ratio of unemployment to vacancies (i.e. the 'tightness' of the market), $\theta = \frac{v}{u}$. Given the arrival of contacts, the individual transitions from an unmatched to a matched state are $q = \frac{m(u,v)}{v} = q(\theta)$ for firms and $\theta q(\theta)$ for workers, with $q'(\theta) < 0$.

The model includes Bellman equations for the asset values of vacant and non-vacant firms, employed and unemployed workers. The firm opens a vacancy, sustains search costs c, and job creation takes place when the complementary partners meet and agree to a way to share the rents. Let F^m be the present-discounted value of expected profit from a job filled by a worker from a remittance recipient family. Similarly define F^{nm} as the asset value of a job filled by a worker from a 'non-migrant' family. Let V be the asset value for the vacant firm. Introducing capital into the model, we follow Pissarides (2000) and let k be the capital stock per efficiency unit of labour. Then, given the wage bargaining process specified below, the value function for each job type is given by:

$$rF^i = pf(k) - pk(r + \delta) - w^i + \lambda(V - F^i)\,;\; i = m, nm \tag{1}$$

where $f(k)$ is the output produced by a firm, which uses k capital and a worker, w^m is the wage for a worker from a 'migrant family', w^{nm} is is the wage for a worker from a 'non-migrant family', λ is the exogenous destruction rate of jobs and p is a productivity parameter. Capital is lent at the exogenous market interest rate r, which is the discount rate used to calculate asset values, and it is subject to the depreciation rate δ.

When a vacancy is opened but the job is not filled, the firm does not hire capital and its asset value in the steady-state, V, satisfies the following Bellman equation:

$$rV = -c + q(\theta)\left[\bar{F} - V\right] \tag{2}$$

where c represents the recruitment cost and $\bar{F}$ is the average value of a filled vacancy.

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The expected value of a filled job depends on the proportion of 'migrants' and 'non-migrants' in the population:

$$\bar{F} = pF^m + (1 - p) F^{nm} \tag{3}$$

where p represents the probability that a vacancy is filled by a migrant conditional on the event of meeting a worker. If the firm has free access to financial markets offering finance at the interest rate r, then the maximization of F w.r.t k gives the standard result:

$$f'(k) = r + \delta \tag{4}$$

An important assumption is that workers are risk-averse. Risk-averse workers value remittances more if unemployed and the introduction of these transfers modifies their outside option. Let $\bar{z}$ denote the domestic support for the unemployed and $\tilde{z}$ denote income from remittances. Then $z^m = (\bar{z} + \tilde{z})$ and $z^{nm} = \bar{z}$ are the unemployment incomes for the worker in a migrant and non-migrant family respectively. Similarly, $y^m = (w^m + \tilde{z})$ and $y^{nm} = w^{nm}$. The remaining value functions which summarize unemployed and employed workers' asset values are then respectively:

$$rU^i = \ln(z^i) + \theta q (\theta) \left[E^i - U^i \right] \tag{5}$$

$$rE^i = \ln(y^i) + \lambda \left[U^i - E^i \right] \tag{6}$$

for a worker in a family of type $i = m, nm$. (5) implies that the asset value of unemployed worker of type i depends on the unemployment income and the probability of finding a job, $\theta q (\theta)$. (6) implies that the asset value of employed worker of type i depends on the employment income and the exogenous probability of losing a job, λ.

As in Ortega (2000), we assume that firms are not able to discriminate *ex ante* between an unemployed migrant and non-migrant since only information concerning the average characteristics of workers is available when the vacancy is opened. This implies that firms will open the same vacancy for the non-recipient and recipient

unemployed. In the home economy, households will bargain over two different wages and the wage for workers with migrants in the family will be higher than that of workers in non-migrant families since they have a higher 'threat point'.

In equilibrium, all firms enter the market until the asset value from a vacant job, V, is zero. By manipulating the two Bellman equations for the firms and the zero profit assumptions, we can determine the *job creation curve*, JC:

$$p[f(k) - (r + \delta)k] - w - \frac{(\lambda + r)pc}{q(\theta)} = 0 \; ; \; i = nm, m \tag{7}$$

where

$$y = p[f(k) - (r + \delta)k]$$

and w is the average wage in the economy. The relation between the wage and labour market tightness is downward sloping in the (w, θ) space.

During the bargaining stage, the partners agree on a way to share the rents. Wages are determined as the solution to a Nash bargaining problem. Given that the firm surplus is equal to $F^i - V$ and the worker surplus is $E^i - U^i$, the wage is contracted by the following maximization problem:

$$w^i = \arg\max \left[E^i - U^i\right]^\beta \left[F^i - V^i\right]^{1-\beta} \; ; \; i = nm, m$$

where $0 \leq \beta \leq 1$ is the bargaining power of workers. By solving the maximization problem for the two types of workers, we obtain the following wage-setting relations:

$$\ln\left[\frac{(w^m + z^m)}{z^m}\right] = \frac{\beta}{1 - \beta} \left(\frac{1}{w^m + z^m}\right) \left(\frac{y - w^m}{r + \lambda}\right) \tag{8}$$

$$\ln\left[\frac{(w^{nm} + z^{nm})}{z^{nm}}\right] = \frac{\beta}{1 - \beta} \left(\frac{1}{w^{nm} + z^{nm}}\right) \left(\frac{y - w^{nm}}{r + \lambda}\right) \tag{9}$$

The wage setting curves are upward sloping relations in the (θ, w^i) space.

To complete the matching model with capital, the evolution of unemployment is given by

$$\dot{u} = \lambda (1 - u) - \theta q(\theta) u \tag{10}$$

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In the steady state, $\dot{u} = 0$ and we arrive at the *Beveridge Curve* (BC):

$$u = \frac{\lambda}{\lambda + \theta q\left(\theta\right)} \tag{11}$$

Five equations (4), (7), (8), (9) and (11) give steady-state values for $k,$, θ, w^i and u. The 'labour market tightness' parameter $\theta = \frac{v}{u}$ gives the vacancy rate and completes the description of the steady-state equilibrium[8].

3.2   Credit Market Imperfections

Without some constraint on the ability to raise finance for investment, remittances can affect the unemployment income, but they would have no effect on the capital stock. Firms would choose the optimal level of the capital stock (per efficiency unit of labour) at $k = k^*$, given by (4). However, as discussed in the introduction, the lack of formal channels to obtain credit that characterizes many developing and transitional countries can generate financial constraints for firms. We therefore assume that firms cannot raise sufficient finance to pay for their optimal choice of capital. With credit constraints $k < k^*$, remittances now play a dual role since they also relax credits constraints and enable the firm to get closer to its optimal capital stock. The increase in capital will then have a positive impact on, both, the wage rate and the labour market tightness and a negative impact on the unemployment rate. This is illustrated in figure 1 and 2. To see this 'investment effect' algebraically, we differentiate the wage-setting curve with respect to k and obtain [9]:

$$\frac{d\theta}{dk} = -\frac{\partial f/\partial k}{\partial F/\partial \theta} > 0$$

The second effect of remittances is to increase the search utility.

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[8]Please refer to Lehmann and Van der Linden (2004) for a proof of existence and uniqueness in the presence of risk-aversion.

[9]In the appendix A we show that the denominator is always negative and the numerator is positive in presence of credit constraints.

<u>Lemma</u>

The 'search effect' can move in both directions:

$$\frac{d\theta}{d\tilde{z}} = -\frac{\partial f/\partial \tilde{z}}{\partial F/\partial \theta} \gtrless 0$$

since the denominator is negative and the numerator can be both positive and negative. We show that the numerator and the search effect are negative for low values of β and c and for a wide gap between wages and domestic unemployment benefits..

Proof: see Appendix A.

Suppose that variables θ, k and z refer to a post-migration state with remittances and in the pre-migration state without remittances they take values $\bar{\theta}$, $\bar{k}$ and $\bar{z}$. The model is completed by assuming there is a given proportion of workers and entrepreneurs in the economy that receive remittances. Recipient workers use remittances to increase their consumption while entrepreneurs use the income streams to ease firm's credit constraints[10]. Let us call s the proportion of workers who receive and consume remittances and $(1-s)$ the proportion of entrepreneurs who invest remittances. In a steady state, per capita capital stock rises by $\tilde{z}\,(1-s)\,/\delta = \bar{k}$[11] until such a point where $k = k^*$.

The complete model with migration now consists of (4), (7), (8), (9) and (11) and the capital stock is given by:

$$
\begin{aligned}
k \;&=\; \bar{k} + \tilde{z}\,(1-\gamma)\,/\delta = \bar{k} + \tilde{k}, \quad \text{if } \bar{k} + \tilde{k} \leq k^* \\
&=\; k^*, \qquad\quad\ \text{if } \bar{k} + \tilde{k} \geq k^*
\end{aligned}
\tag{12}
$$

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We can now summarise our results as a proposition:

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[10]For simplicity we assume that all entrepreneurs are recipients.

[11]Using $\dot{k} = -\delta k + i$ where i is investment.

<u>Proposition</u>

Remittances can have two opposite effects on the unemployment rate: First, given risk-averse workers, they increase search utility and, for low values of β and c, and for a wide gap between wages and domestic unemployment income, the unemployment rate rises. Second, they relax the credit constraint facing firms, raising the capital stock towards its optimal level and reducing the unemployment rate. When remittance income is sufficiently high, the optimal capital stock is reached and any further increase only has the search effect.

The analysis shows that when the workers' power over employers is low, remittances have an ambiguous impact on employment while if the workers' power is strong, then remittances have an unambiguous positive impact on employment (negative impact on unemployment). For example, if the outside option is high, then the impact of remittances on unemployment is negative since the search effect and the investment effect are both positive. Similarly, remittances increase the utility of unemployed over employed only when the initial outside option (i.e. the difference between wages and domestic unemployment income) is high. In this case the search effect of remittances increases unemployment. This is a characteristics of our model with risk-averse workers.

4 Empirical Analysis

4.1 Data

The theoretical model presented in the previous section predicts that whilst the effect of remittances on unemployment is ambiguous, they have a positive impact on investment. In order to test these predictions, aggregate data have been collected for those countries where remittances constitute an important part of the economy. More specifically, countries were selected if remittances were at least 1% of GDP

during the sample period, which begins in 1976 and finishes in 2003. Inclusion within the sample also required an adequate number of observations on unemployment and the other covariates to be included in the econometric models. As a result of these restrictions we are left with 19 countries. However, given the lack of complete data on remittances, unemployment and the other explanatory variables for some countries, we have an unbalanced panel[12].

Before estimating econometric models of unemployment, it is useful to observe the importance of remittances to the countries contained in the dataset and the extent to which these countries have suffered from unemployment. Table 1 in Appendix C therefore reports some descriptive statistics on remittances and unemployment for the countries in the sample. Remittances are most important to Egypt, the Dominican Republic, Morocco, Portugal, Sri Lanka and Honduras, where they were equivalent to more than 6% of GDP over the sample period. However, there has been a general increase in the importance of remittances to developing countries over time. This is illustrated by the average level of remittances as a percentage of GDP rising to 4.72% since 2000, compared to an average of 3.78% over the whole sample period. Unemployment also varies across the countries in the sample, with Jamaica experiencing average unemployment rates in excess of 25% between 1976 and 1985 and average rates of at least 15% in Barbados, the Dominican Republic and Morocco. In contrast, the average unemployment rate was 5% or less in Mexico and Pakistan[13].

Given that one of the predictions from the theoretical analysis was that remittances should increase investment levels in credit constrained economies, econometric models which investigate the impact that remittances have on investment are

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[12]Further details of the dataset can be found in the data appendix.

[13]Underemployment is also a major issue in some developing countries because their labour markets tend not to be efficient and they usually have large informal sectors. For an analysis of underemployment in Trinidad and Tobago see Gorg and Strobl (2003). However, the underemployment rates they present for the four countries in our sample that feature in their international comparison in Table 1 (Ecuador, Mexico, Paraguay and Turkey) suggest that the problem is relatively small in these countries.

also estimated. Therefore, Table 1 also reports the average level of investment for the countries in the sample, together with the average levels of remittances given that the sample period differs for some countries from the unemployment models, as a result of data availability[14]. Gross Capital Formation as a percentage of GDP is found to range from an average of 16% in Barbados to almost 30% in Nicaragua, although most countries are clustered between 21 and 25%.

4.2 Econometric Specification

Because of the opposing effects that remittances are expected to have on the source country's labour market, as shown in previous sections, and the need to control for other influences on unemployment, it is necessary to test this relationship by estimating an econometric model.

The following equation represents the general form of the model to be estimated:

$$
\begin{aligned}
u_{it} &= x'_{it} + \delta r_{it} + \varepsilon_{it} \\
i &= 1, 2..n; \quad t = 1, 2..T
\end{aligned}
\tag{13}
$$

where u_{it} denotes the unemployment rate in country i in period t and r_{it} the amount that country i receives in remittances (as a proportion of GDP) in period t. x_{it} is a vector of regressors that represents other factors that are expected to influence the unemployment rate. The parameters will predominantly be estimated using fixed effects models. This is because of the nature of the panel under consideration (both a relatively small N and small T) precludes the use of more sophisticated panel data models. For example, Generalised Method of Moment Models (Arellano and Bond, 1991) are commonly used in panels with a large N because of the potentially endogenous nature of some of the explanatory variables. Whilst in panels with a large T, mean group models have been developed by Pesaran and Smith (1995) because of heterogeneity between the cross-sectional units.

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[14]The investment variable used here is Gross Capital Formation as a percentage of GDP, which is very similar to the Gross Domestic Investment variable created by Easterly and Sewadeh (2001) since the correlation coefficient between these two measures is in excess of 0.95.

Data limitations also constrain the explanatory variables that can be included in the econometric models. For example, few if any of the countries have information on the types of institutions (e.g. union density, centralisation of wage bargaining, tax wedges, employment protection, duration of benefits and replacement rates) that have been examined by recent studies of OECD unemployment (Blanchard and Wolfers, 2000; Nickell et al., 2005). Given these restrictions and the fact that countries in the sample are less developed than those in the OECD, more dated studies of OECD unemployment, which focus more on demand and supply factors i.e. the influence of economic shocks, as well as studies that analyse unemployment in individual developing countries have been used to inform which explanatory variables to include.

Bruno (1986) estimates a reduced form equation for unemployment, which is expressed as a function of the real wage gap and aggregate demand factors, namely the real money stock and the government fiscal deficit. Contractionary monetary or fiscal policies, to reduce inflation, will shift the aggregate demand curve inwards. For example, Bruno (1986) argues that a restrictive monetary policy, such as those followed by several OECD governments in the early 1980s, should cause unemployment to rise. He includes two lags for each of the explanatory variables and estimates a pooled model in first differences for 8 countries for the period 1962-1982. He finds that the lagged first difference of the real money supply has a negative and significant effect on unemployment but the difference lagged two periods is not significant (although it is positive). The lagged differences for real wages have a positive and significant influence on unemployment, whereas increases in the government deficit cause unemployment to fall.

McCullum (1986) also includes aggregate demand factors in his model of unemployment in 14 OECD countries between 1980 and 1984. The variables he uses are the percentage change in the narrowly defined money supply deflated by the GNP deflator minus the trend growth in the real money supply in the preceding period and the cyclically adjusted government budget balance as a percentage of GNP. He

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finds that the fiscal and monetary multipliers have their expected effects and estimates that a 1 per cent increase in real money supply causes a 0.18 per cent increase in output a year later. Nickell et al. (2005) also include money supply shocks in their model of unemployment in 20 OECD countries between 1961 and 1995.

Marquez and Pages (1997) estimate the effect of trade liberalisation on unemployment using a panel of 18 Latin American and Caribbean countries which have at least 15 observations with complete information. Trade liberalisation is captured by four variables: openness, tariffs, the black market premium and a trade reform index. Of these, they only find that the trade reform policies exert a significant influence and its effect is to increase unemployment but they also suggest that movements in and out of employment dominate the unemployment effects of the reduction in protection. McCallum (1986) also multiplies each of the explanatory variables in his model by the ratio of imports of goods and services to GNP for each country minus the mean value for all countries to indicate how much the estimated parameters are influenced by openness.

4.3   Results for Unemployment

Table 2 in Appendix C presents estimates of the determinants of unemployment in developing countries. Two specifications of the model are estimated. The first specification captures the influence of openness, monetary and fiscal polices, as well as remittances and lagged unemployment and should to some extent capture the influence of omitted ariables. The latter variable is included in each of the models estimated by Nickell et al. (2005) [15]. A second specification includes more dynamics, in particular it adds the lagged values of all explanatory variables.

The impact of remittances is negative and insignificant in both of the specifications. When the lag of remittances is included, the coefficient attached to the

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[15]Ideally we would also like to include some measure of wages, as Bruno (1986) does. However, wage data are not readily available for many developing economies, which means that it is not possible to control for wages in this way.

level of remittances is reduced when time dummies are excluded, but the lagged term changes sign m also changes sign when time dummies are added. In terms of the other explanatory variables, the influence of the lagged unemployment term is positive and also highly significant. The coefficient attached to the lagged dependent variable is in excess of 0.7 in all cases, which is of similar magnitude to the Generalised Least Squares estimates obtained by Nickell et al. (2005) for OECD countries[16]. In both of the specifications, the coefficient attached to the money supply variable is positive, which is contrary to expectations and to the findings of Bruno (1986), but it is not significantly different from zero. The coefficients on the other explanatory variables also tend not to reach the commonly used levels of significance, although higher deficit levels are associated with lower unemployment rates at the 5% level in the first specification when time dummies are included.

4.4   Results for Investment

To further examine the effect that remittances have on relaxing credit constraints, Table 3 in Appendix C reports panel data estimates for the determinants of Gross Capital Formation as a percentage of GDP. Knack and Keefer (1997) use a similar dependent variable to examine the effect that social capital has on economic performance in 29 countries. To estimate the determinants of investment, we mainly follow the empirical strategy used by Pindyck and Solimano (1993) and Goel and Ram (2001), by including uncertainty (proxied by the 5-year moving average of inflation), the real lending rate (proxied by the real interest rate) and the change in economic activity (proxied by the one-period lag on the rate of growth of real GDP) as explanatory variables. We also add controls for remittances and aid to this specification, the latter variable is included to compare its effect relative to that of remittances. The basic model is initially estimated by OLS and subsequently by fixed effects. A second specification replaces the contemporaneous remittances

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[16]The coefficient on the remittances variable is similar if the lagged dependent variable is excluded and remains insignificant at the 5% level.

variable with its lagged value because of the possible endogeneity of the variable when entered as a level. Estimates from the fixed effects models which include time dummies are also reported.

In specification 1, the effect of the current level of remittances on investment is particularly strong and highly significant, which appears to provide strong support for the hypothesis that remittances ease credit constraints in developing countries. This result is obtained regardless of whether the model is estimated using OLS or fixed effects and whether time dummies are included or not. The other variables also generally have their expected signs. The influence of the lag of economic activity is particularly strong, whilst the measure of uncertainty is significant at the 15% level or better. The impact of the real interest rate is weak, which is consistent with the findings of Goel and Ram (2001), since they do not report a significant effect for this variable in any of their models. Aid also exerts a significant influence on investment when OLS is used but the coefficient loses significance and also changes sign once fixed effects are controlled for. This is in accordance with the findings of Rajan and Subramanian (2005), who note that remittances may not increase the demand for scarce resources as much as aid and may simutaneously contribute to their supply. The effect of remittances is slightly weakened in the second specification, which includes the lag of remittances rather than the level but it still remains large and highly significant.

5   Conclusions

Given that the remittances that accrue from international migration are becoming an ever increasing and important aspect of the global economy, it is important to examine the impact of such flows. In this paper, the focus has been placed on the effect that remittances have on the source economy, in particular what impact they have on unemployment. It is argued that remittances can have two opposing effects on unemployment in the labour exporting country. Firstly, unemployment could be raised if remittances are seen by their recipients as providing some sort of wel-

fare payment. Secondly, remittances could reduce credit constraints in developing economies and hence encourage firms to increase their investment levels. The overall effect on unemployment will depend on which of these effects dominates.[17] The relationship between remittances and unemployment was tested using data from a panel of developing economies. It is found that remittances have negative but insignificant effect on unemployment, thus suggesting that the investment and search income effects of remittances have partially offsetting influences. The effect of remittances on investment was also tested econometrically and the results indicate that there is a stronger relationship between investment and remittances. In particular, a positive and significant association is found to exist between remittances and a country's investment levels in the fixed effects models that are estimated.

The analysis in this paper has mainly been conducted at an aggregate level, both in terms of the theory and empirics. This has a number of advantages such as providing an overall perspective on the effects of remittances. However, to gain a better understanding of the links between remittances, the decision to work and investment, it is also necessary to examine these relationships at a more disaggregated level. For example, performing the theoretical analysis at the household level and examining microdata would provide further insights into these important issues, which could be used to inform on the likely impact of particular development policies. Thus, future research should be focused in this direction.

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[17]Credit constraints have been modelled in a simple way with an imposing limit on the amount of capital that can be financed. Further work will endogenize this decision using the idea of a financial accelerator as in Cespedes, Chang and Velasco (2004) and Gertler, Gilchrist and Natalucci (2003).

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A Proof of Lemma

Two wage setting curves, one for the migrant family and one for the non-migrant family:

$$\ln\left[\frac{(w^m + z^m)}{z^m}\right] = \frac{\beta}{1-\beta}\left(\frac{1}{w^m + z^m}\right)\left(\frac{y - w^m}{r + \lambda}\right)$$

$$\ln\left[\frac{(w^{nm} + z^{nm})}{z^{nm}}\right] = \frac{\beta}{1-\beta}\left(\frac{1}{w^{nm} + z^{nm}}\right)\left(\frac{y - w^{nm}}{r + \lambda}\right)$$

with $z^m = \bar{z} + \tilde{z}$ and $z^{nm} = \bar{z}$

We call f_1 the first relation and f_2 the second one. We can take the average expression for the value of the filled vacancy:

$$\bar{F} = \frac{c}{q(\theta)}$$

and substitute in f_1 f_2. We then obtain two relations in function of θ. The average wage is then obtained as:

$$w = pf_1\left(\bar{z}; \tilde{z}\right) + (1 - p)f_2\left(\bar{z}\right)$$

We also know, from the free-entry condition that:

$$w = py - \frac{(r + \lambda)c}{q(\theta)}$$

We are interested on the sign of $\frac{d\theta}{d\tilde{z}}$ and $\frac{d\theta}{dk}$ in order to investigate the search income and the investment effects algebrically. Let us define:

$$F_1(\theta) = f_1(\theta, \sigma(\theta))$$

$$F_2(\theta) = f_2(\theta, \sigma(\theta))$$

where $w^i = \sigma^i(\theta) > 0$.

For example:

$$w^m = \sigma^m(\theta) = y - \frac{c(r + \lambda)}{sq(\theta)} + \frac{1 - p}{p}(y - w^{nm})$$

So

$$F_\theta = pF_{1\theta} + (1 - p)F_{2\theta}$$

Then

$$F_{1\theta} = f_{1\theta} + \sigma^{m\prime}(\theta)f_{w^m}$$

$$F_{2\theta} = f_{2\theta} + \sigma^{nm\prime}(\theta)f_{w^{nm}}$$

Similarly:

$$F_{1k} = f_{1k} + \sigma^{m\prime}(\theta)f_{w^m}$$

$$F_{2k} = f_{2k} + \sigma^{nm\prime}(\theta)f_{w^{nm}}$$

and

$$F_k = pF_{1k} + (1 - p)F_{2k}$$

25

while

$$F_{\tilde{z}} = f_{\tilde{z}}$$

and

$$F_{\tilde{z}} = pF_{1\tilde{z}}$$

$$F_{\tilde{z}} = p\frac{\beta c - w^m (1 - \beta)}{z^m (w^m + z^m)(1 - \beta) q(\theta)}$$

$$f_{1\theta} = \frac{\beta c q'(\theta)}{(1 - \beta)(w^m + z^m)[q(\theta)]^2} < 0$$

$$f_{2\theta} = \frac{\beta c q'(\theta)}{(1 - \beta)(w^{nm} + z^{nm})[q(\theta)]^2} < 0$$

$$\sigma^{m'}(\theta) = \sigma^{nm'}(\theta) = \frac{q'(\theta) c (r + \lambda)}{p [q(\theta)]^2} < 0$$

$$F_k \geqslant 0$$

and positive in presence of credit constraints.

By totally differentiating

$$F(\theta) = 0$$

with respect to $\tilde{z}$ and k we have:

$$F_\theta \frac{d\theta}{d\tilde{z}} + F_{\tilde{z}} = 0$$

and

$$F_\theta \frac{d\theta}{dk} + F_k = 0$$

To show the search and investment effect algebrically, we need to study the sign of:

$$\frac{d\theta}{d\tilde{z}} = -\frac{F_{\tilde{z}}}{F_\theta}$$

and

$$\frac{d\theta}{dk} = -\frac{F_k}{F_\theta}$$

As before, the denominator is always negative and the sign of the two expressions depends on the sign of $F_{\tilde{z}}$ and F_k.

$$F_k > 0$$

when credit constraints are binding while $F_{\tilde{z}} \lessgtr 0$ and it is negative for

$$c < \frac{(1 - \beta)}{\beta} w^m$$

which is satisfied for values of β small enough.

B Data Appendix and Results

B.1 Definitions of variables included in the model and data sources

Dependent variables

Unemployment rate - Definitions vary slightly by country but typically relate to the number of unemployed divided by the economically active population. Main source: International Labour Organisation (ILO). These data are used if there are any inconsistencies with the other sources, which include the World Bank's World Development Indicators (WDI), the International Monetary Fund's International Financial Statistics (IFS) and Turnham and Erocal (1990).

Investment - Gross Capital Formation as a percentage of GDP. Source: WDI.

Explanatory variables

Remittances - Total amount of workers' remittances received in the country as recorded in the Balance of Payment Statistics in current US$ as a percentage of GDP. Source: WDI.

Money Supply - Money and Quasi Money (M2) as a percentage of GDP. Source: Easterly-Sewadeh and WDI.

Openness - Total trade as a percentage of GDP. Sources: Easterly-Sewadeh and WDI.

Fiscal Policy - Budget deficit as a percentage of GDP. Source: IFS and WDI.

Uncertainty 5-year Moving Average of the Consumer Price Index. Source: WDI.

Economic Activity Real Growth Rate of GDP. Source: WDI.

Real interest rates - Nominal interest rate minus the inflation rate. Source: WDI.
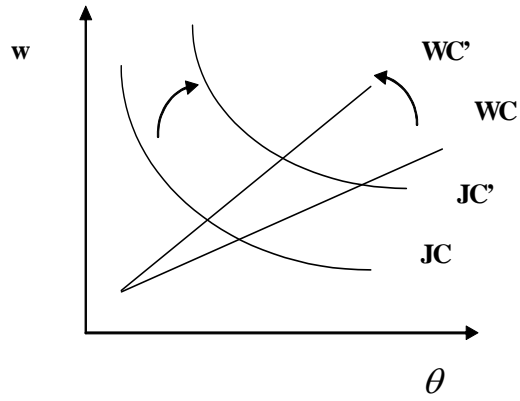
Aid - Aid as a percentage of GNI. Source: WDI.

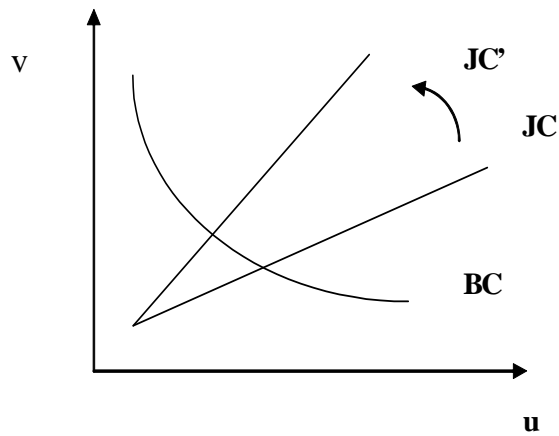Figure 1: **The Effect of an Increase in Capital on Labour Market Tightness.**

Figure 2: **The Effect of an Increase in Capital on Unemployment and Vacancy Rates**

Table 1: **Descriptive Statistics for Countries in Dataset**

	Unemployment models			Investment models		
	Sample Period	$\bar{u}_{it}$	$\bar{r}_{it}$	**Sample Period**	$\bar{i}_{it}$	$\bar{r}_{it}$
Barbados	1987-2002	15.8	2.31	1987-2002	16.29	2.31
Belize	1994-1997	12.5	2.31	1984-2003	24.08	3.73
Columbia	1976-2003	11.5	1.07	1986-2003	18.61	1.54
Croatia	1994-2002	13.4	2.67	1994-2003	23.44	2.68
Dominican Republic	1992-2001	16.4	7.23	1991-2003	22.36	7.55
Ecuador	1990-2003	9.2	3.41	1990-2003	21.73	3.41
Egypt	1977-1984, 1990-2002	7.8	8.24	1977-2003	23.85	8.19
Greece	1981-1997	7.8	2.28	1976-1990	25.06	2.31
Honduras	1996-2002	4.7	6.09	1987-2003	28.30	4.10
Jamaica	1976-1985	25.6	1.88	1976-2003	23.89	5.25
Mexico	1981-1988, 1992-2003	3.4	1.04	1993-2003	22.36	1.29
Morocco	1986-2003	17.9	6.97	1978-2003	23.37	6.76
Nicaragua	1992-2002	14.4	4.80	1992-2003	29.63	5.29
Pakistan	1981-2002	5.0	4.72	-	-	-
Paraguay	1990-2001	7.0	1.33	1990-2003	23.09	1.40
Peru	1991-2001	7.9	1.04	1991-2000	21.32	1.00
Portugal	1980-1998	6.7	6.40	-	-	-
Sri Lanka	1991-2001	11.5	6.21	1978-2001	24.97	5.51
Turkey	1983-2001	8.6	2.23	-	-	-
All Countries	1976-2003	10.3	3.78	1976-2003	23.36	4.37

Notes: Pakistan and Turkey are excluded from the investment models because of a lack of data on interest rates in these countries, whilst there is no information on aid to Portugal.

Table 2: **Fixed Effects Estimates of Unemployment in Developing Countries**

	(1)		(2)	
	FE	**FE**	**FE**	**FE**
u_{it-1}	0.724	0.723	0.721	0.719
	(0.057)	(0.060)	(0.045)	(0.049)
r_{it}	-0.119	-0.133	-0.102	-0.160
	(0.075)	(0.095)	(0.122)	(0.131)
r_{it-1}	-	-	-0.028	0.024
			(0.120)	(0.129)
m_{it}	0.017	0.007	0.032	0.028
	(0.014)	(0.018)	(0.039)	(0.045)
m_{it-1}	-	-	-0.012	-0.021
			(0.039)	(0.045)
d_{it}	-0.050	-0.080	-0.035	-0.058
	(0.034)	(0.038)	(0.053)	(0.056)
d_{it-1}	-	-	-0.028	-0.046
			(0.055)	(0.058)
o_{it}	-0.017	-0.020	-0.010	-0.009
	(0.010)	(0.014)	((0.019)	(0.021)
o_{it-1}	-	-	-0.010	-0.015
			(0.020)	(0.022)
Constant	3.456	4.958	3.562	5.240
	(0.943)	(1.307)	(1.004)	(1.683)
Time Dummies	No	Yes	No	Yes
R^2	0.569	0.616	0.571	0.619
NT	260	260	260	260

Notes:

1. The explanatory variables in the table are as follows: u denotes the unemployment rate, r remittances as a percentage of GDP, m the money supply as a percentage of GDP, d the budget deficit as a percentage of GDP, and o is a measure of openness. See the data appendix for details of the definitions and sources of these variables.
2. Heteroskedasticity robust standard errors are in parentheses.

Table 3: **Panel Estimates of Investment in Developing Countries**

	(1)			(2)	
	OLS	**FE**	**FE**	**FE**	**FE**
p_{it}	-0.003	-0.003	-0.003	-0.004	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
g_{it-1}	0.322	0.418	0.437	0.428	0.451
	(0.068)	(0.066)	(0.071)	(0.067)	(0.074)
i_{it}	0.005	-0.023	-0.016	-0.009	-0.001
	(0.027)	(0.031)	(0.034)	(0.032)	(0.034)
r_{it}	0.428	0.784	0.827	-	-
	(0.107)	(0.118)	(0.124)		
r_{it-1}	-	-	-	0.701	0.733
				(0.129)	(0.138)
a_{it}	0.309	-0.034	-0.141	0.014	-0.058
	(0.075)	(0.104)	(0.132)	(0.128)	(0.146)
Constant	19.268	18.978	17.430	19.134	-17.142
	(0.637)	(0.826)	(3.047)	(0.932)	(3.256)
Time Dummies	No	No	Yes	No	Yes
R^2	0.315	0.328	0.402	0.275	0.352
NT	245	245	245	245	245

Notes:
1. The explanatory variables in the table are as follows: p denotes the 5-year moving average of the inflation rate, g the real growth rate, i the real interest rate, r remittances as a percentage of GDP and a aid as a percentage of GNI .
2. Heteroskedasticity robust standard errors are in parentheses.