Centre for Research and Analysis of Migration

CReAM

Discussion Paper Series

CDP No 08/08

Migration, Relationship Capital and International Travel: Theory and Evidence

Philip McCann, Jacques Poot and Lynda Sanderson

Centre for Research and Analysis of Migration
Department of Economics, University College London
Drayton House, 30 Gordon Street, London WC1H 0AX

CReAM Discussion Paper No 08/08

Migration, Relationship Capital and International Travel: Theory and Evidence

Philip McCann*, Jacques Poot and Lynda Sanderson†**

* University of Waikato and University of Reading
** Population Studies Centre, University of Waikato
† Reserve Bank of New Zealand

Non-Technical Abstract

In this paper we consider how international migration is related to the frequency and duration of trips to the home country. For many migrants, international migration triggers a series of trips to visit the home country that allow for a replenishment of the depleted relationship capital with family and friends back home, but these trips incur travel costs and foregone earnings. Given plausible assumptions about the depreciation and replenishment of home country relationship capital, a steady-state level of average maintained relationship capital implies that the optimized travel frequency is inversely related to the distance and the transportation costs, and positively related to the psychological costs of separation. The total time spent at home is increasing in the trip frequency, but with an elasticity that is decreasing in cultural proximity. Empirical evidence in support of these theoretical predictions is found in a unique longitudinal sample of international travel of 13,674 New Zealand citizens and 6,882 UK citizens who migrated to Australia between 1 August 1999 and 31 July 2000.

Keywords: International Migration; Trip Frequency, Relationship Capital

JEL Classification: F22, J61, R23, Z13

Centre for Research and Analysis of Migration
Department of Economics, Drayton House, 30 Gordon Street, London WC1H 0AX
Telephone Number: +44 (0)20 7679 5888
Facsimile Number: +44 (0)20 7916 2775

Migration, Relationship Capital and International Travel: Theory and Evidence*

Philip McCann[1], Jacques Poot[2] and Lynda Sanderson[3]

Abstract

In this paper we consider how international migration is related to the frequency and duration of trips to the home country. For many migrants, international migration triggers a series of trips to visit the home country that allow for a replenishment of the depleted relationship capital with family and friends back home, but these trips incur travel costs and foregone earnings. Given plausible assumptions about the depreciation and replenishment of home country relationship capital, a steady-state level of average maintained relationship capital implies that the optimized travel frequency is inversely related to the distance and the transportation costs, and positively related to the psychological costs of separation. The total time spent at home is increasing in the trip frequency, but with an elasticity that is decreasing in cultural proximity. Empirical evidence in support of these theoretical predictions is found in a unique longitudinal sample of international travel of 13,674 New Zealand citizens and 6,882 UK citizens who migrated to Australia between 1 August 1999 and 31 July 2000.

Keywords: International Migration; Trip Frequency, Relationship Capital

JEL Classification: F22, J61, R23, Z13

22 August 2008

---

* The research reported in this paper was funded by Marsden grant UOW0402. The unit record data used were provided in confidentialized form by the former Australian Department of Immigration, Multicultural and Indigenous Affairs (DIMIA).

[1] University of Waikato and University of Reading. Address for correspondence: Department of Economics, University of Waikato, Private Bag 3105, Hamilton, New Zealand. Email: pmccann@waikato.ac.nz

[2] Population Studies Centre, University of Waikato, Private Bag 3105, Hamilton, New Zealand. Email: jpoot@waikato.ac.nz

[3] Reserve Bank of New Zealand, PO Box 2498, Wellington, New Zealand. Email: lynda.sanderson@rbnz.govt.nz

Migration, Relationship Capital and International Travel: Theory and Evidence

1. Introduction

The intensifying links between countries in terms of cross-border flows of goods, money, information and people have been one of the most discussed features of global change during the last few decades. Among these flows, the border crossing of people has been identified as the issue of greatest concern at present. Major reports by the OECD and World Bank highlight the political and economic issues resulting from international migration (World Bank 2006; OECD 2006). At present, most of the world's citizens still reside for their entire lives in the country in which they were born, but the number that at some stage of their life will become a resident of another country to work, to study, or even to retire, has been rapidly increasing. Of the current world population of 6.8 billion, about 200 million (3 percent) live in a country other than their country of birth. While this may still seem a rather small percentage, the share of migrants in the population of high-income countries almost doubled between 1970 and 2000. In addition, there has been rapid growth in the number of temporary residents, who are not counted as immigrants but who may reside in a foreign country for 12 months or more to study or to work. Additionally, seasonal labor demand may be partially met by seasonal workers from abroad.

In this new global environment, the notion of migration as once-in-a-lifetime change of country of residence is becoming increasingly flawed, and multiple migrations over the life course are now of growing interest in international migration research (Constant and Zimmermann 2007; Dustmann 2003). For many migrants, a spell of working abroad may be a strategy to boost lifetime income, but they may migrate with the intention of returning to their home country, or of moving on to one or more other countries. In addition, the possibilities for more complex global mobility patterns are emerging from globalization trends, firstly, because migrants are now much better informed than in the past about opportunities elsewhere; secondly, because pecuniary and non-pecuniary costs of migration have become less; thirdly, because institutional barriers to migration have been reduced particularly in the case of high skilled and temporary migrants; fourthly, because of greater global economic integration; and fifthly, because of the reduction in the real cost of travel (Glaeser and

Kohlhase 2004) and communication. These changes imply that the frequency of international migration will increase.

Meanwhile, there are sociological arguments which suggest that the frequency of international travel behavior triggered by such migration will also increase. Of particular interest here is the visiting of relatives and friends in the home country. In the sociological literature the mutually beneficial relationships among family and friends are referred to as 'relationship capital' (Dollahite and Rommel 1993) and separation from family and friends in the home country still remains a significant cost of international migration, notwithstanding the changes associated with globalization.[4] The maintenance of relationship capital is therefore still very important for many migrants, and the institutional and technological changes associated with globalization provide new travel opportunities for maintaining relationship capital between family and friends across different countries (de Coulon and Wolff 2005). In particular, we might expect to observe higher frequency mobility in terms of short-term visits back home in order to maintain relationship capital (Chamberlain and Leydesdorff 2004). However, to date this type of mobility has been largely neglected by economists. There has previously been no formal modeling or empirical testing of the frequency of international travel associated with the maintenance of relationship capital. It is this specific type of international travel behavior which is the central focus of this paper.

We start from the assumption that high frequency mobility (travel) and low frequency mobility (migration) are related. Each migration opportunity will be associated with a discounted stream of benefits that will endogenously determine consumption levels as well as an optimal level of relationship capital maintained with the home country. The level of relationship capital of migrants who decide to live abroad indefinitely, and the related psychological costs of separation, can be expected to be lower than those of the migrant who intends to return home. Consequently, shorter migration spells ought to correspond with a more intense maintaining of relationships with family and friends. While the level of such capital could in principle be quantified by Likert-scale survey-based questions in psychological and sociological research, this is not the objective of the present paper. Rather, our objective is to demonstrate that it is possible to derive implications for visits to family

[4] In a recent survey of 7,137 new immigrants in New Zealand, 'distance from home or family' rated as the second most disliked aspect of living in their new host country, after dissatisfaction with high tax rates (Statistics New Zealand, 2008).

and friends from the existence of such unmeasured capital by assuming that, for any given migration spell, the *average* level of relationship capital is set at a steady-state value determined by long-term inter-temporal utility maximization. Once average relationship capital is assumed to be constant, the impact of its depreciation while living abroad and its replenishment while visiting home on the optimal number of trips back home and the total time spent back home and away from the workplace location, can be determined in a manner analogous to that of inventory analysis (McCann and Ward 2004; McCann 2007). Given plausible assumptions about the depreciation and accumulation of home country relationship capital, we show that a steady-state level of average maintained relationship capital implies that the optimized travel frequency is inversely related to distance and transportation costs, and positively related to the psychological costs of separation. Moreover, the total time spent at home is increasing in the optimized trip frequency and the elasticity of this relationship is decreasing in the extent of cultural proximity between the two countries.

Empirical evidence in support of all these theoretical predictions is found in a unique longitudinal sample of all international travel up to July 2005 of 13,674 New Zealand citizens and 6,882 UK citizens who migrated to Australia between 1 August 1999 and 31 July 2000. The data were provided in confidentialized form by the former Australian Department of Immigration, Multicultural and Indigenous Affairs (DIMIA) and contain demographic information, reasons for short-term travel, intended duration of stay in Australia and occupation of the migrant. While the available information on each individual is rather modest, the data have the major advantage of being longitudinal and capturing both short-term travel and possible re-migration. To our knowledge, this is the first time that a longitudinal database of short-term travel of international migrants has been made available to researchers.

In section 2 we show that under reasonable assumptions regarding the depreciation and replenishment of home country relationship capital, the time spent back home to maintain average relationship capital at a predetermined steady state, is increasing in trip frequency with a positive elasticity of between zero and one. This elasticity reflects the cultural distance between the home and host countries, i.e. where cultures are perceived to be very similar the elasticity will be small. Armed with this result, in section 3 we then formally derive optimal home country travel frequency and time spent at home and away from the work location in terms of a migrant's opportunity cost of time, the distance between the countries, the unit cost of travel, the psychological attachment to the home country, and the cultural proximity of the countries. In sections 4 and 5 we employ our longitudinal unit record data to empirically test the hypotheses derived from the theoretical model. The results confirm the theoretical predictions of our model, and are also seen to be consistent with the results from a range of other inventory-theoretic frameworks.

2. Relationship Capital and Migration Frequency

To simplify matters, consider two countries: home H and abroad A. A worker is endowed with human capital E for which the returns may vary spatially and temporally. This may at some stage lead to a migration from H to A, in line with the migration model originally proposed by Sjaastad (1962). When visiting the home country, the migrant enjoys the benefits of home country relationship capital P^H that yields support and satisfaction from personal interaction with family and friends. While abroad, home country relationship capital depreciates but visits back home permit a replenishing of this. A steady state is defined as a spell living in A during which an average level of relationship capital P^H is maintained (see Figure 1). The migrant allocates time Z between H and A. This allocation of time will be economically determined in what follows in a way that minimizes the total cost of maintaining P^H at its predetermined level. Naturally, a migrant will build up location-tied relationship capital abroad as well and for an average level of P^H there will be a corresponding average level of P^A. The psychological costs of being away from H would then need to be compared with the psychological costs of being away from A, and eventually visits to H may no longer yield a net benefit (e.g., when all close relatives have died or migrated themselves). However, in the present paper we focus on visits during the first five years after migration. It is then plausible to assume that relationship capital P^H remains at a predetermined level that is much more than P^A and for mathematical simplicity we will set the latter to zero.

Figure 1 about here

Without loss of generality we can think of a day as a unit of measurement. Let h be the fraction of time spent back in the home country, referred to as *home country attachment*. The migrant makes f trips back home throughout a period of length Z

days, during which a steady state is maintained. Hence f is the *trip frequency* and T^H is the duration in days of a spell back home per trip, so that $T^H = hZ/f$. There is no reason to take account of spells of unequal duration. Thus, the initial migration spell $T^A = (1-h)Z/f$ will be followed by a trip home T^H and this sequence will continue until the end of the time horizon. Time away from home leads to depreciation of home-country relationship capital. Each day spent abroad leads to a further loss of this relationship capital, but each day spent back home during a visit enables some replenishment of the relationship capital. In a steady state, the average level of home country relationship capital will be constant at some predetermined level. Depreciation $D(P_0,T)$ is a monotonically increasing function of the level of relationship capital P_0 at the time of leaving H and the number of days T spent abroad since then. When in A, the remaining level of home-country relationship capital after T days is therefore $P_0-D(P_0,T)$. Similarly, replenishment $R(P_*,T)$ is a function of the level of relationship capital P_* at the time of returning to H and time spent back home T. When in H, the replenished level of relationship capital after having been back home T days is $P_*+ R(P_*,T)$.

For a given time horizon Z, it is clear that a higher frequency of trips back home coincides with each spell back home being shorter in order to maintain the same average level P^H. This is true for any curvature of the monotonic depreciation and accumulation functions. Hence, assuming a constant elasticity, we can write:

$$T^H = gZf^{-\psi}, \qquad (1)$$

with $\psi > 0$ and g a scaling constant. Therefore, the total time spent back home for given time horizon Z is

$$f\,T^H = g\,Zf^{1-\psi} \equiv hZ, \qquad (2)$$

and, consequently,

$$h = g\,f^{1-\psi}. \qquad (3)$$

However, whether the fraction of time spent back home h is increasing in the frequency of trips f, i.e. whether $0 < \psi < 1$, depends on the functional forms of the relationship capital accumulation and depreciation functions.

In Figure 1, the rate of depreciation of relationship capital per unit of time is declining with increasing time abroad. We can adopt for simplicity the conventional assumption of depreciation at a constant rate over the declining balance, but other concave functions $D(P_0,T)$ are also possible. The time needed at home in order to bring back relationship capital to a level such that a constant average level of P^H is maintained, is denoted in Figure 1 as T^H. The replenishing of relationship capital $R(P_*,T)$ is assumed to have diminishing returns. Under these assumptions, Figure 1 shows that a constant average level of P^H can be maintained with either frequent trips (pairs T^A and T^H) or less frequent trips (pairs $T^{A\prime}$ and $T^{H\prime}$). In general, for a given average level of home country relationship capital, the correspondence between home country attachment h and the trip frequency f is determined by the functional forms for relationship capital depreciation and accumulation, and together these functional forms determine ψ.

It is easy to show that if relationship capital depreciation and replenishment in Figure 1 are linear functions of time with slopes δ and α respectively, the fraction of time spent back home h to maintain any given level of relationship capital P^H is $\delta/(\delta+\alpha)$, and as such, is independent of the trip frequency f. Hence, in this case, $\psi = 1$. Given that travel is costly, if $\psi = 1$, it is always optimal to maintain relationship capital by making just one trip throughout time Z. In other words, the optimal trip frequency $f^* = 1$ in that case, irrespective of the distance or travel costs. This is, however, an exception.

When $\psi \neq 1$, equation (3) defines the functional relationship between the trip frequency f and home country attachment h. Given that $\psi > 0$, there are two possibilities. In the case that $0 < \psi < 1$, total home country attachment increases in the frequency of trips, whereas when $\psi > 1$ total time visiting the home country decreases in f. Geometrically, it can be shown that as long as the average curvature of depreciation as a function of time is greater than the average curvature of rebuilding of home country location-tied relationship capital, and these curvatures are not strongly dependent on the initial level of relationship capital, then $\psi < 1$.[5]

In support of these general arguments we note that, following migration, the intensity of home contact and interest in home country local affairs tends to be high during the initial days and weeks after leaving home, but then settles down to less intense frequent contact activity.[6] At the same time, a return trip home permits a highly effective replenishing of home country relationship capital during the early part of the visit, but the rate of replenishment from face-to-face contact is likely to exhibit decreasing marginal returns to the time spent back home per trip. As such, it is quite plausible that both the relationship capital depreciation and replenishment rates decrease over time.

The actual rates of depreciation and replenishment of relationship capital are a function of a number of exogenous factors such as the cultural or linguistic distance between countries H and A, and the emotional stability of the family relationships.[7] We would expect that in cultural and linguistic terms, the closer are the home and work locations, the closer will be the value of ψ to 1, while the further apart are the locations, the lower will be the value of ψ. The reason is that, with a small cultural or linguistic distance between the home and employment locations, the sense of separation from one's cultural roots will be relatively low, whereas for high cultural and linguistic distances, the sense of separation will be very marked. Where the cultural and linguistic distances are relatively low, we would expect the rate of relationship capital depreciation to change relatively little over time and for replenishing to proceed relatively quickly. With a higher trip frequency each trip will then be significantly shorter and the total time spent back home not much longer. On the other hand, where the cultural and linguistic distances are relatively high, we expect the depreciation rate to change significantly over time and for replenishing to proceed slowly. In our model, ψ therefore represents the degree of cultural and linguistic proximity.

---

[5] This is elaborated in the Appendix.

[6] Migrants typically experience homesickness (Thurber and Walton 2007), and most people experience particularly acute homesickness in the first few days after their departure from home (Van Tilburg et al. 1996). In our model, the anxiety with associated homesickness would reflect the slope of the relationship capital depreciation function, while the excitement associated with being reunited with family and friends is represented by the slope of the relationship capital replenishment function.

[7] The measurement of cultural and linguistic distance as distinct from geographical distance is a major issue in the international business literature (Shenkar 2001; West and Graham 2004).

With these general principles we are now in a position to model the impact of the distance between countries, the cost of travel, the opportunity cost of time and cultural proximity on the optimal frequency of trips back home and the total time spent at home. We focus on the migrants who, even though they move abroad for work, wish to maintain home country relationship capital at a steady state level. We ignore those migrants who decide to move abroad and plan to never visit home, i.e. for whom $P^H = 0$.

3. Optimal Travel Behavior

The optimization problem faced by the migrant is to determine the optimum trip frequency and the optimum duration of return trips home, given a predetermined steady state average level of relationship capital that they wish to maintain in the home country. The optimum trip frequency is determined by the journey costs, by the opportunity costs of absence from *A*, taking into account the psychological costs of separation avoided when visiting relatives and friends at home. Conceptually, the situation is analogous to a stock-inventory-theoretic analysis (McCann 1993, 2007; McCann and Ward 2004).

3.1 Visiting Costs

The calculation of the visiting costs can be determined as follows. The total distance cost per trip is given by ω. This cost is obviously related to the distance d between H and A. We will assume that the distance cost ω is given by $\omega = cd^{\mu}$, i.e. we allow for non-linear cost structures with distance. There is also a time cost incurred for each trip. This is the sum of the return travel time plus the minimum stay away associated with each journey in order to overcome jet-lag and travel exhaustion. The threshold minimum period away from work for each journey can also be non-linearly related to distance, and is here denoted ad^{ν}. The opportunity cost of a day of travel time is a function of w, the after-tax daily wage rate in country A, say w^{η}. The total visiting costs, O_1, are the product of the visiting costs per trip and the number of trips made. Hence

$$O_1 = (aw^{\eta}d^{\nu} + cd^{\mu})f \tag{4}$$

3.2 *Opportunity Costs Associated with Location*

The opportunity cost of absence from *A* is equal to the pecuniary cost of the foregone earnings when in *H*. However, during times when the migrant remains in *A*, the daily psychological and emotional opportunity cost of separation from the home location *H* is labeled as o. This cost depends not only on the extent of personal attachment and consumption of amenities at *H*, but also on the personal networks and consumption of amenities at *A*.[8] From the stock-inventory-theoretic analysis above, we see that the total psychological cost associated with working at *A*, is increasing in P^H (which is assumed given for a specific steady-state) and positively related to the length of time T^A of each employment spell. We can express this psychological cost as:

$$o(1-h)Z = o(1-gf^{1-\psi})Z \tag{5}$$

Meanwhile, the pecuniary cost of visiting relatives and friends is equal to the foregone earnings associated with time away from *A* due to visits to *H*. The cost per day is again assumed to be a function of *w*, the after tax daily wage at *A*. Given the total time spent back home of *hZ*, the total pecuniary cost associated with the total time away is:

$$w^{\eta} hZ = w^{\eta} g\ f^{1-\psi} Z \tag{6}$$

The total opportunity costs throughout period *Z*, which are denoted by O_2, is the sum of the psychological cost while in *A* and the pecuniary cost of foregone earnings associated with visiting relatives and friends at *H* and, and can therefore be written as:

$$O_2 = w^{\eta} g\ f^{1-\psi} Z + o(1-g\ f^{1-\psi})Z \tag{7}$$

[8] For any given level of personal attachment to *H*, the greater are the local personal networks and consumption of amenities at *A*, the lower will be the value of o. Conversely, for any given quality of amenities at the employment location *A*, the greater is the level of personal attachment to the home location, the higher will be the value of o.

3.3 *The Optimization Problem*

Given *w*, *o*, *c*, *d*, ψ, *Z*, and the parameters of equations (4) and (7), the optimization problem is therefore to determine the optimum travel frequency f^* and the corresponding optimum fraction of time spent at home $h^* = g(f^*)^{1-\psi}$, which minimizes the total costs incurred over period *Z* to maintain average relationship capital at P^H. These total costs are given by:

$$TC = O_1 + O_2 = (aw^{\eta}d^{\nu} + cd^{\mu})f + w^{\eta}gf^{1-\psi}Z + o(1-gf^{1-\psi})Z \qquad (8)$$

Differentiating (8) with respect to *f* and setting to zero gives:

$$f^* = \left[\frac{(o-w^{\eta})(1-\psi)gZ}{(aw^{\eta}d^{\nu}+cd^{\mu})}\right]^{\frac{1}{\psi}} \qquad (9)$$

For f^* to be a interior minimum with $f^*>0$ requires that $o > w^{\eta}$, whereby the daily opportunity cost of time (foregone earnings) is less than the daily emotional benefit of visiting relatives and friends.[9] If this is not the case then the optimum is always at the corner solution of $f^*=0$, irrespective of the value of *Z*.

Assuming that we have an interior minimum whereby with $f^*>0$, equation (9) can be rewritten as:

$$f^* = \left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1}{\psi}}\left[aw^{\eta}d^{\nu}+cd^{\mu}\right]^{-\frac{1}{\psi}} \qquad (10)$$

From equation (10) we can see how the optimized trip frequency f^* is related to the distance *d* between the home country *H* and the employment location *A*, the after tax wage *w* in *A*, the per unit transport costs *c* involved in travelling between the home *H*

[9] We know that for f^* to be positive, then $o - w^{\eta} > 0$. If $f^*>1$ it implies that multiple trips are made per time period *Z*. On the other hand, it is also perfectly possible for $0< f^*<1$, such that if we employ a time horizon of *Z* = 1 year, a value of $f^* = 0.5$ implies that at the optimum, one trip is made every other year. If the value of Z = 1 decade, then $f^*=5$, i.e. one trip is made every two years, and the calculated optimum trip frequency is therefore unchanged. Such scaling adjustments thereby allow us to avoid integer problems, and it is even possible to normalize the inventory-theoretic framework into an annuity model (McCann and Ward 2004).

and employment A locations, the psychological costs o associated with attachment to the home location H, and the cultural and linguistic proximity ψ.

Differentiating equation (10) with respect to each of the arguments d, c, o, w and ψ gives:

$$\frac{\partial f^*}{\partial d} = -\frac{1}{\psi}(\nu a w^{\eta} d^{\nu-1} + \mu c d^{\mu-1})\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1}{\psi}}\left[aw^{\eta}d^{\nu} + cd^{\mu}\right]^{-\frac{(1+\psi)}{\psi}} \quad (11)$$

$$\frac{\partial f^*}{\partial c} = -\frac{1}{\psi}d^{\mu}\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1}{\psi}}\left[aw^{\eta}d^{\nu} + cd^{\mu}\right]^{-\frac{(1+\psi)}{\psi}} \quad (12)$$

$$\frac{\partial f^*}{\partial o} = \frac{1}{\psi}(1-\psi)gZ\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1-\psi}{\psi}}\left[aw^{\eta}d^{\nu} + cd^{\mu}\right]^{-\frac{1}{\psi}} \quad (13)$$

$$\frac{\partial f^*}{\partial w} = -\frac{\eta}{\psi}(1-\psi)gZ\, w^{\eta-1}\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1-\psi}{\psi}}\left[aw^{\eta}d^{\nu} + cd^{\mu}\right]^{-\frac{1}{\psi}}$$

$$-\frac{a\eta d^{\nu}w^{\eta-1}}{\psi}\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1}{\psi}}\left[aw^{\eta}d^{\nu} + cd^{\mu}\right]^{-\frac{(1+\psi)}{\psi}} \quad (14)$$

With respect to $\frac{\partial f^*}{\partial \psi}$ we first convert (10) into natural logs, which yields

$$\ln(f^*) = \psi^{-1}\ln\left[(o-w^{\eta})gZ\right] + \psi^{-1}\ln(1-\psi) - \psi^{-1}\ln(aw^{\eta}d^{\nu} + cd^{\mu}) \quad (15)$$

Differentiating (15) with respect to ψ gives

$$\frac{\partial f^*}{\partial \psi} = \frac{\partial \ln f^*}{\partial \psi} f^* =$$

$$\left\{-\psi^{-2}\ln\left[(o-w^{\eta})gZ\right] - \psi^{-2}\ln(1-\psi) - \frac{1}{\psi(1-\psi)} - \psi^{-2}\ln(aw^{\eta}d^{\nu} + cd^{\mu})\right\} f^* \quad (16)$$

We see that the derivatives in (11), (12), (14) and (16) are negative and the derivative in (13) is positive when all the parameters η, a, ν and $\mu > 0$, and $\psi < 1$. Hence we see that the optimized frequency f^* is always negatively related to the journey distance d, the per unit journey travel cost *c*, the wage earned *w*, and the cultural proximity ψ and positively related to the psychological cost *o* of separation.[10]

3.4 *Extensions of the Basic Model*

The results obtained so far are straightforward, and imply that *both* the optimized trip frequency and the total time spent away from the workplace location *fall* with increasing distance *d* from home, increased transportation costs *c* and with increased cultural proximity ψ, and *rise* with increased psychological costs *o*, ceteris paribus.

However, the relationship between wages *w* and the optimized travel frequency f^* is rather more complex than what is suggested by differentiating equation (10). In the cost minimization problem, both the optimum number of trips away f^* and also the total time spent at home h^*Z fall as the wage *w* in the employment location increases. The reason is that *both* the costs of each trip and also the total time period spent away from work are associated with increasing time opportunity costs to the worker.

However, there may also be a wage-income effect working in the opposite direction to this substitution effect. If the per journey travel costs $(aw^{\eta}d^{\nu} + cd^{\mu})$ are not trivial with respect to total income $w(1-h)Z$, then at low wage and income levels, individuals may be budget-constrained from travelling, whereas at higher wage and income levels, the demand for utility yielding leisure (i.e. spending time with one's family and friends in the home location) may be highly income elastic.

In an orthodox microeconomic consumption model which trades off leisure consumption with work-hours (Morgan et al. 2006), the income and substitution effects of wages move in the opposite direction. The net effect of these opposing effects is therefore ambiguous and, depending on the relative strength of these effects, may cause the labor supply curve to be backward sloping at higher wage levels. In our travel to maintain relationship capital model, the income effect of higher wage levels leads to increased leisure time spent at the home location. Consequently, as with the simple leisure-employment trade-off, the overall effect of wage changes on the time spent at home away from the work location is an empirical matter. As such, although we can the unambiguously ascertain the direction of the substitution effect, the overall relationship between f^* and *w* can only be ascertained empirically. As we will see in

[10] and therefore f^* is positively related to the cultural and linguistic distance $(1-\psi)$

section 5, higher wages (measured by skill levels) are in reality generally associated with a higher frequency of travel and an increasing total time spent at home. Part of this time may be to maintain family relationship capital; part of it may be for utility yielding leisure activities, and this is consistent with a backward-sloping labor supply curve argument. We also observe in section 5 that for highly skilled workers the estimate of increased cultural proximity ψ is greater, i.e. relationship capital is maintained with greater efficiency, and this would induce a lower optimal frequency of travel. However, the combined effect of this, and the dominant income effect of the demand for travel for those with high skills and earnings, leads to a greater travel frequency and greater time spent back home.

An additional possible issue is that the psychological costs of separation *o* might themselves be a function of distance, at least over large variations in distance, whereby $\partial o/\partial d$ could be positive (i.e., 'absence makes the heart grow fonder') or negative (i.e., 'out of sight out of mind'). In order to examine the implications of this possibility we can differentiate equation (10) with respect to distance, whereby we allow for $\partial o/\partial d$ to be non-zero:

$$\frac{\partial f^*}{\partial d} = -\frac{1}{\psi}(\nu awd^{\nu-1} + \mu cd^{\mu-1})\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1}{\psi}}\left[awd^{\nu} + cd^{\mu}\right]^{-\frac{(1+\psi)}{\psi}}$$
$$+\frac{1}{\psi}\left(\frac{\partial o}{\partial d}\right)(1-\psi)gZ\left[(o-w^{\eta})(1-\psi)gZ\right]^{\frac{1-\psi}{\psi}}\left[awd^{\nu} + cd^{\mu}\right]^{-\frac{1}{\psi}} \tag{17}$$

If $\partial o/\partial d$ is negative ('out of sight out of mind') then not only is equation (17) always negative, but the derivative is even more negative than in the case of $\partial o/\partial d=0$ (compare with equation (11)). As such, the optimized frequency of travel and the share of time spent at home fall even more with respect to increasing distance. Alternatively, if $\partial o/\partial d$ is positive ('absence makes the heart grow fonder'), then equation (17) can be either positive or negative, depending on the relative strength of the two opposing distance effects. As such, the frequency of travel and the share of time spent at home could either fall or rise with increasing distance. In practice, we would generally expect the overall effect to still be negative, although the optimized travel frequency and time spent at home will be greater than otherwise would have been the case. Once again, this is ultimately an empirical matter.

We can also extend this basic analysis further by considering three possible impacts on the level of psychological costs o, namely the repatriation of remittances, gender, and the advent of new information and communication technologies (ICTs). For migrants who send remittances home, the altruistic motives for remittances also imply that the repatriation of remittances decreases the psychological cost o of separation associated with migration. As such, remittances act as a partial substitute for interpersonal contact at home. In this case, the frequency of journeys home will fall, ceteris paribus, as will the total time hZ spent at home.

Similarly, if there are gender differences with respect to o whereby women suffer the psychological costs of separation more than men due to their having stronger family ties, the frequency of journeys home will be higher for women, ceteris paribus, as will the total time hZ spent at home. An alternative explanation here also is that if women are less likely to be in full-time employment, or if their wages are less than those of their male partners, then the effect will be the same, or even reinforced, ceteris paribus.[11]

Recently we have seen the advent of new ICTs such as free video phone contact with relatives abroad through webcams and supporting internet software. If the use of this virtual face-to-face contact decreases the psychological cost o of migration by acting as a partial substitute for actual face-to-face contact, the frequency of trips and the total length of time spent at home will fall.

Finally, we recall from the arguments at the beginning of section 3 that the model predicts an unambiguous relationship between the optimized trip frequency and the fraction of total available time Z that is spent away from the workplace location. The total number of days spent away from work at the home location H is given by $h^*Z = g(f^*)^{1-\psi}Z$. Therefore, as long as $0<\psi<1$ the total time period away from work always increases with the optimized trip frequency f^*. Each trip, however, is of duration $T^{H*} = h^*Z \ / \ f = g(f^*)^{-\psi}Z$, which therefore decreases with the optimized trip frequency f^* when $0<\psi<1$.

[11] An Australian government survey of social capital finds that women in Australia have stronger links with their families than men, and also visit their families more often. See BTRE (2005).

Taken together, our analysis in the previous two sections provides us with the following testable hypotheses:

Hypothesis (1)

Both the optimized frequency of travel f^* and the optimized total time spent at home h^* are negatively related to the total travel costs $(awd^{v} + cd^{\mu})$, while the optimized length of stay per trip home T^{H*} is positively related to the travel costs.

Hypothesis (2)

Both the optimized frequency of travel f^* and the optimized total time spent at home h^* are positively related to the to the psychological costs o of separation, while the optimized length of stay per trip home T^{H*} is negatively related to the psychological costs o of separation.

Hypothesis (3)

The relationships between the wages w earned, the optimized frequency f^* of travel, the optimized length of stay per trip home T^{H*}, and the total optimized share of time spent at the home location h^*, are theoretically ambiguous. They can only be determined by empirical observation.

Hypothesis (4)

Both the optimized frequency of travel f^* and the total time spent at home h^* away from the workplace location are negatively related to the cultural or linguistic proximity ψ, while the optimized length of stay per trip home T^{H*} is positively related to the cultural or linguistic proximity.

In the following empirical sections, we are able to analyze and test propositions (1)-(3). The data available to us are longitudinal data on migrants from the UK and New Zealand. At present no information has been made available on other migrant groups, but we will show that the propositions hold for at least these two specific groups. We can assume that there is little difference in the value of ψ between the two groups, because of the high degree of cultural and linguistic proximity between all three countries. Following our arguments in section 3, the high degree of cultural and linguistic proximity between all three countries means that the value of ψ for both UK and NZ migrants should be relatively much closer to 1, than for most other international migration moves between other pairs of countries.[12] As we have seen, this implies that for both groups, the optimum trip frequency f^* ought to be as *low* as possible, and the value of h^* to be largely invariant to any of the costs arguments, such that these groups ought to display the *least* sensitivity to travel cost variations, at least with respect to maintaining relationship capital. Therefore, any empirical evidence of differences in the trip frequency f^* and time at home h^* between these two groups, would be a robust test of the applicability of the arguments to other more diverse cohorts of migrants.

4. The Data: UK and New Zealand Migrants to Australia

In order to test the hypotheses emerging from the theory outlined in sections 2 and 3, we utilize a unique longitudinal dataset provided in 2005 by the (former) Australian Department of Immigration, Multicultural and Indigenous Affairs (DIMIA).[13] Australian legislation requires all passengers who enter or leave Australia by plane or ship to complete a passenger card. The cards include questions about current travel itineraries as well as personal characteristics such as age and occupation.

When a non-Australian resident arrives stating an intention to remain in Australia for 12 months or more, they are classified as a Permanent or Long-Term (PLT) migrant. Passenger card details are recorded in full for all PLT arrivals and are then integrated with details available from the Travel and Immigration Processing System (TRIPS), which records travelers' passport and visa information, including age, sex, and marital status.[14] After new PLT arrivals have been captured in the system all their subsequent moves into and out of Australia are fully documented, regardless of the intended or actual duration of each trip.[15]

---

[12] There is, however, some heterogeneity between migrants groups with respect to values of ψ. We shall see in section 5 (Table 9) that this parameter tends to be larger for New Zealand citizens than for UK citizens. It is also larger for the highly skilled and for the young. However, there is no gender variation. All of these findings are as expected.

[13] The Department has undergone two name changes over the past few years, and is currently the Department of Immigration and Citizenship.

[14] Marital status is recorded on visa applications and is not available for New Zealand citizens, who are issued a Special Category Visa on arrival in Australia.

[15] Travellers are allocated a unique identification number which is linked to their passport. There may be some understatement of travel frequency if migrants travel on multiple passports during the observation period. In some cases multiple passport holders can be identified by impossible patterns of

The sample used in this paper includes all New Zealand and UK citizens who migrated to Australia over the period from 1 August 1999 to 31 July 2000 and remained resident in Australia throughout the next 5 years.[16] The full sample includes a total of 25,530 New Zealanders and 11,405 UK citizens. The age structure of this full sample is shown in Figure 2. For both groups, the modal age group of migration to Australia is 25-29 years, but this group accounts for disproportionally more UK migrants than New Zealand migrants.

In order to focus on the frequency of return visits among labor force participants, as motivated by the theory, we restrict the empirical analysis to those migrants aged 15 to 65 to whom we can attribute a skill level, based on their usual occupation. This gives us a sample of 13,674 NZ and 6,882 UK citizens.

Figure 2 about here

All travelers into and out of Australia are asked to state their usual occupation on their passenger cards. While other details such as date of birth can be cross-referenced to visa and passport details, and response rates for items such as main reason for overseas travel and state of (intended) residence in Australia are generally high, the question on usual occupation is frequently left blank. Occupation may be considered as a proxy for skill and is the only indicator of income and the opportunity cost of time in the international travel data. Consequently, a high incidence of missing occupation data potentially creates a difficulty in testing the propositions with respect to the impact of wage earnings on visits to the home country. However, the problem is substantially alleviated in the current dataset by the availability of multiple records for each individual. While only 30 percent of all observations (border crossings) include a stated occupation, almost all individuals in the sample provided an answer to this question at least once over the course of their trips into and out of Australia.

While individuals may hold a number of jobs over their lifetimes, it seems reasonable to assume that the skill sets involved in these jobs are likely to be similar, especially over the relatively short period of five years covered by the current dataset. Therefore, we define a variable *main occupation* as the modal stated occupation over

---

travel (for example, being observed to leave the country three times in succession without being seen to return in the meantime). These individuals are excluded from the dataset.

[16] Remaining resident is defined as resident for taxation purposes, with a person being classed as resident if they are in Australia for at least 6 months in every year.

each individual's observations. In cases where there is not a unique modal occupation, the higher skilled occupation is chosen as the main occupation.

A second variable, *skill class*, is then defined as a proxy for the skill level of this occupation. Three skill categories are defined: *high-skilled*, *semi-skilled* and *low-skilled*, with the allocation of occupations to these categories according to a one-digit Australia and New Zealand Standard Classification of Occupations (ANZSCO), as shown in Table 1.

Table 1 about here

Sample characteristics are outlined in Table 2. Overall, migrants from the UK tend to be younger and more likely to be in highly skilled occupations than migrants from New Zealand. This will primarily reflect the different visa regulations affecting migrants from the UK (with the young and highly skilled more likely to obtain entry) relative to the visa-free entry of New Zealanders to Australia under the Trans-Tasman Travel Agreement (TTTA).

Table 2 about here

The sample contains relatively more males than females, but the gender ratio is identical across the two nationalities. However, the proportion of UK citizen migrants born outside the UK is much lower than the proportion of New Zealand citizen migrants born outside New Zealand. This reflects the relatively higher proportion of the New Zealand citizen population which was born outside of New Zealand.[17]

Another difference between the two groups is the proportion who declared themselves as 'permanent arrivals' on their initial arrival to Australia. Australian arrival cards ask passengers to identify themselves as either 'migrating permanently to Australia' or as a 'visitor or temporary entrant'. Over two thirds of the new arrivals from New Zealand (who remained resident in Australia for the following five years) identified themselves as permanent migrants, compared to around 38 percent of those from the UK.

[17] In 2001, foreign born persons accounted for 19% percent of the New Zealand resident population compared with 8.3% of the UK population (New Zealand and UK Census data).

We make use of two additional pieces of information provided on passenger cards, namely the main purpose of the trips out of Australia, and the state of residence within Australia. This information is requested both on exiting Australia and on re-entry. Overall response rates for the two questions are 34 and 74 percent respectively. As we know that everyone in the sample remained resident in Australia for the full 5 years, some missing responses can be filled in where migrants have given information for one leg of a trip but not the other. For example, if a person states on their departure card that the purpose of their trip is 'education' but does not respond to the question on their return, we take the purpose given on departure and vice versa. The same procedure is used for state of residence. Using these imputations, purpose of travel and state of residence are available for 67 and 81 percent of exits, respectively.

The main purpose of the state of residence variable is to identify differences in travel costs. States on the Eastern side of Australia are both more heavily populated and closer to New Zealand. International travelers from these more populated states are expected to have lower travel costs due to a greater availability of international flights going into and out of large airports, as well as greater proximity of such airports. The location in Australia will impact more on the time and financial cost of flights home for New Zealand than for UK travelers, as the results of the next section will confirm. Overall, 30 percent of New Zealanders and 76 percent of UK migrants lived predominantly in the eastern states of Australia during the observation period.

In order to protect subjects' privacy, the date of each move is recorded only as the month in which it occurred. An individual who arrives in Australia on the first of the month, stays one week, and then takes a two week trip abroad before returning to Australia again will therefore be shown as having made three journeys (two entries and one exit) over the course of the month. The impact of this form of record is to make the analysis of duration somewhat coarse. We therefore define location as the location at midnight on the last day of the month, with a person who is outside Australia at that time is counted as being out of Australia for the entire month.

Table 3 shows the distribution of the reasons for travel among our sample of labor migrants. Among New Zealanders, visiting friends and relatives was by far the most common reason for travelling, making up around 37 percent of all trips away. Holidays, the second most popular reason for travel among New Zealanders, made up around 18 percent of all exits. In contrast, among UK citizens, the reasons for travel were fairly equally spread between visits to friends and family, holidays, business trips and other employment related trips, each making up between 13 and 17 percent of exits. This may reflect the composition of the migrant samples, with a higher proportion of UK migrants being in highly skilled occupations, which are more likely to involve frequent travel. But it also reflects the greater cost of visits home, due to the greater distance to travel.

Table 3 about here

5. The Empirics of Trip Frequency, Trip Duration and Time at Home

In this section we first test the aspects of the hypotheses (1)-(3) regarding the trip frequency f, and then we proceed to test the aspects of the hypotheses regarding the fraction of time spent at home h. Following the predictions of our theoretical arguments, in this empirical section our objective is to see whether observed f reflects the predicted properties of f^*, observed h reflects the predicted properties of h^*, and observed T^H reflects the predicted properties of T^{H*}.

The trip frequency distribution is highly skewed. From Table 4 we see that one percent of all migrants in the sample make more than 16 trips over the five-year period after moving to Australia. On the other hand, less than 10 percent of the New Zealanders visit family and friends more than three times over the five years. Over half of all UK citizens are never observed over the five years to make a trip with the primary purpose of visiting friends and relatives back home.

Table 4 also shows that the overall travel frequencies differ somewhat between NZ and UK citizens in Australia, with New Zealanders taking more trips on average than UK migrants, as the theory suggests. However, as we see in Table 4, it is the difference in the number of *visits to friends and family* that it most dramatic. New Zealanders make on average 1.27 visits over 5 years compared to an average of 0.49 visits by UK citizens.

However, as noted in our theoretical section, the relationship capital model does not apply when P^H=0 and consequently f=0. Excluding these cases, New Zealanders make on average 2.19 visits compared to an average of 1.45 visits by UK citizens. It is not surprising that the averages are quite low, given the highly skewed distribution of trip frequencies already made clear from Table 4. The average time per visit is estimated as 16 days for NZ citizens and 27 days for UK citizens, i.e. increasing in travel cost as expected. Interestingly, average total time away on visits over the five years is 37 days for UK citizens and 32 days for NZ citizens, contrary our expectation of the latter being *greater* than the former. Because these averages are not accounting for differences between the two groups that may affect mobility behavior also (such as skill level, gender etc.), we now proceed with multivariate analysis.

Table 4 and 5 about here

Table 6 presents a negative binomial model of trip frequency for NZ citizens and UK citizens. It is clear that the skewed distribution already detected in Table 4 is characterized by overdispersion. The null hypothesis of a Poisson data generating process ($\alpha = 0$) is strongly rejected. The counts model provides further evidence in support of our hypothesized relationship between distance and trip frequency in Hypothesis (1). Not only are those living in the Eastern states of Australia more mobile than those who are resident further west, but also the coefficient is greater for the NZ citizens than the UK citizens. This reflects the relatively greater impact of different location within Australia on the costs of travel for New Zealand citizens than for UK migrants. For a UK migrant, there is almost no difference at all between the time and cost of a return journey from Perth to the UK and a return journey from Sydney to the UK. In contrast, for a New Zealander the time and money costs of a return journey from Sydney or Melbourne to Auckland is only one half of the return journey costs from Perth to Auckland. These observations are all consistent with our model predictions.

In terms of the theoretically ambiguous effect of wages on trip frequency as proposed by Hypothesis (3), we see in Table 6 that both groups exhibit a negative relationship between skill level and mobility, with individuals in low and semi-skilled occupations making significantly fewer visits to friends and family than those in highly skilled occupations. This reflects the lower disposable incomes of those in less skilled occupations. Hence the income effect appears stronger than the lower opportunity cost of time effect. Travel costs for those on low incomes are non-trivial.[18]

[18] This is not surprising given that the cost of airplane tickets (cd^{μ}) for a family of four persons travelling between the major East Coast cities of Australia (Sydney, Melbourne, Brisbane) and Auckland NZ would typically be of the order of 8% of the average Australian after tax annual wage,

Table 6 about here

There is a very noticeable impact of gender on the frequency of visits across the two groups, with females making more visits home than males. If women tend to place relatively more value on maintaining relationships with family and friends back home than men, this gender observation would therefore be consistent with Hypothesis (2).

The main differences between the two groups are in the impact of being non-native born, and the effect of age. Among New Zealanders, the non-native born tend to make fewer visits to New Zealand than the New Zealand born, while for UK citizens there is no significant difference between the two groups. We suspect that these differences are indirectly related to the impacts of travel costs and distance. The geographical proximity of New Zealand and Australia means that almost all non-New Zealand-born NZ citizens will have to travel further to visit relatives in the country of their birth than will those born in New Zealand. On the other hand, almost all non-native born UK citizens will actually be closer to their country of birth than to their country of citizenship.

The coefficients on age and age squared reflect the differences in age composition of the two groups. For the full sample, NZ citizens show a U-shaped relationship between age and mobility, while for the UK citizens this relationship is an inverse-U. Supplementary regressions which split each group into those 20 to 35 and those 35 and over show that in both cases the younger group shows a significant inverse U-shaped relationship between age and mobility, while for the older group the impact of age is barely significant for the NZ citizens and insignificant for the UK citizens.[19] Together these results suggest that mobility, in terms of the number of return visits home, peaks in the late 20s to early 30s and then flattens out somewhat in later life.

To compare the average number of trips taken by New Zealand and UK citizens, while controlling for the differences in personal characteristics, we pool the

---

between Adelaide and Auckland NZ would be of the order of 12%, and between Perth and Auckland the airfares would be of the order of 16% of the average Australian after tax annual wage. For a family of four undertaking a return trip between Australia and UK, the fare would typically be more than 40% of the average Australian after tax annual wage.

[19] These results are available from the authors upon request.

data for the two migrant groups and include interaction terms to allow for differences in the coefficients on personal variables, i.e. we control fully for heterogeneity by country of citizenship (Table 7). The results show that controlling for personal characteristics dramatically increases the observed impact of distance on mobility rates of the two groups. While the unadjusted average counts shown in Table 4 show that UK migrants make just under 40 percent of the number of trips New Zealand migrants make, after controlling for the composition of the two groups (e.g. the higher average skill and lower average age of the UK migrants) UK migrants are estimated to make only about 3 percent of the trips that NZ migrants with similar characteristics make.[20] There is no statistically significant difference between the two nationalities in the effect of skill and gender.

Table 7 about here

To further investigate the relationship between trip frequency and trip duration we run a panel model with fixed individual and time effects in order to estimate a fixed effects panel regression model of the relationship between total time spent visiting family and friends and the trip frequency, i.e. $\ln hZ = \ln gZ + (1-\psi)\ln f$ (see equation (2)). The model is estimated by splitting each individual's mobility history into two 2½ year sub-periods. This allows us to control for different levels of unobserved psychological attachment to family and friends between individuals, and thereby concentrate on the relationship between frequency and duration of travel. The sample is restricted to those migrants who made at least one trip home visiting family and friends in each sub-period. The time fixed effect provides some degree of control for changes in the cost of travel over time. No observable characteristics are added to the fixed effects panel model as the observable characteristics we have available are largely time invariant over the five year observation period.[21] The results are reported in Table 8. The time effect is not significant, and the elasticity is 0.415. This is the estimate of $1-\hat{\psi}$, i.e. $\hat{\psi} = 0.585$. This result suggests in general that a doubling of the

[20] The coefficient is given by -3.706. In the counts model this translates to the average frequency for UK citizens being exp(-3.706) of that of the NZ citizens, i.e. 0.025 or 2.5 percent.
[21] There is some variation in the *state of residence* variable, but this is fairly minimal, with 83.25 percent of individuals having only a single recorded state of residence.

number of trips implies that an individual will spend just over 40% more time away in total, although each individual trip will be approximately 30% shorter.

Table 8 about here

Of course, it can be argued that there could be significant heterogeneity in that the elasticity of total time away *hZ* with respect to trip frequency *f* may vary across migrant groups. To test for heterogeneity, Table 9 shows the estimated elasticity across a variety of sub-samples based on different observable characteristics. The model is the same as in Table 8. Once again, the time dummy is never significant, suggesting that there have been no overall changes in the relationship between frequency and duration for 1999-2000 migrants over the subsequent 2000 to 2005 period. Again, observation of the elasticities associated with each sub-sample reported in Table 8 shows that for men the elasticity is 0.416; for women 0.414, and for the total sample 0.415. For convenience, the estimates of $\hat{\psi}$ are also listed.

Table 9 about here

We do observe some differences between the much longer distance migrants and the shorter distance migrants. The UK migrants and the NZ citizens who are resident in the west of Australia[22] both exhibit elasticities just under 0.57, such that with a doubling of the number of trips away they spend 57% more time away from Australia. On the other hand, for the NZ citizens who are resident in the Eastern States of Australia, the elasticity is 0.38, with the overall average NZ elasticity being 0.4. Consequently, the estimate of $\hat{\psi}$ varies across the sub-groups between 0.43 and 0.62. This parameter was earlier interpreted as a measure of cultural proximity. In the present context, we see that its estimate is somewhat greater for the highly skilled, for New Zealanders in Eastern States and for younger workers.

The above results regarding both the trip frequency and the total time away are all in agreement with the results predicted from Hypotheses (1)-(3). As such, we can

[22] The vast majority of the UK citizens will have migrated between approximately 14,900 and 16,900 km and the NZ citizens living in Western Australia will have migrated of the order of 5,400 km. On the other hand, the NZ citizens living on the East Coast of Australia will have migrated between 2,300 and 2,600 km.

safely assume that the observed behavior of f reflects the predicted properties of f^*, and the observed behavior of h reflects the predicted properties of h^*. In addition, an observed elasticity of 0.415 between the total optimized time spent at home h^* and the optimized trip frequency f^*, implies that a doubling of the trip frequency f is associated with an optimized total time spent at home which is exactly $\sqrt{2}$ longer than before. This observation is precisely what would be anticipated on the basis of many types of inventory-theoretic models (McCann 1993, 2001; McCann and Ward 2004) in which the behavioral rules governed by optimization behavior are typically related to square root functions.

Finally, we return to the issue of the potential relationship between high frequency mobility (such as visiting relatives and friends) and low frequency mobility (migration). While we have assumed so far that the level of relationship capital is fixed within the observation period (under the assumption of a steady state), it is clear that the optimal level of relationship capital may be related to an intention to re-migrate. It is plausible that those who have no intention to ever return home to work will maintain a lower average level of relationship capital. Consequently, the psychological costs of absence from relatives and friends (o in our theoretical model) will also be lower for this group. Hypothesis (2) suggests that in this case the frequency of trips and total time spent back home will also be lower. Some evidence to support this prediction is given in Table 10. In this table, two groups of labor migrants are considered. One group – those who stayed throughout the five year period – consists of those migrants who represented the observations in the previous tables (13,674 NZ citizens and 6,882 UK citizens). We first added a row in the table for those migrants who lived in Australia at least until February 2003, but who re-migrated from Australia during the subsequent 2.5 years. The results are exactly as expected. The proportion of migrants who made at least one trip to visit relatives and friends during the first 2.5 years is greater for NZ citizens than for UK citizens, irrespective of the likelihood of re-migration. This is the travel cost effect already confirmed in previous tables. However, we now find additionally that the visiting rate for NZ citizens who re-migrate is 0.599 while for those who stayed throughout the five years in Australia it is only 0.359. The corresponding comparison for UK citizen migrants is 0.118 with 0.105. Thus, the difference is much larger for the New Zealanders.

Table 10 about here

Of course, Table 10 does not provide conclusive evidence that the causality runs from the propensity to re-migrate to the propensity to visit relatives and friends. It is possible that intensive contact with relatives and friends increases the likelihood of remigration. Fortunately, the available data do provide an instrument that is not influenced by subsequent travel, namely the stated *intention* of stay in Australia upon first arrival. The migrant group can be split into those who intended to stay permanently and those who intended to return at some stage.

When we predict subsequent re-migration by the migration intention, we that the propensity of family visits among those who stayed permanently is indeed greater for those who intended to re-migrate to New Zealand than for those who intended to stay permanently (see Table 10). Interestingly, for UK citizens this does not hold. UK migrants who never intended to return and indeed stayed maintained more family ties than those who intended to return, but nonetheless stayed. We noted earlier that the UK migrants are younger and higher skilled (see Table 2). It is therefore likely that among those who 'changed their mind' and stayed in Australia after intending temporary migration, are relatively more likely to have been single and found a partner in Australia, which may have reduced the benefit of costly visits back to the UK (see footnote 8). Unfortunately, the data do not permit us to identify changes in marital status or household structure.

6. Conclusions

The model framework outlined in this paper has, for the first time, developed a theory of the optimal structure of visits back home by international migrants. These visits allow migrants to replenish their relationship capital with family and friends in their original home country at regular intervals. Migrants will compare the costs of travel and the opportunity costs of time with the psychological costs associated with separation. The model predictions regarding the optimized trip frequency, the optimized total length of time spent in the home location, and the relationship between each of these trip features and other variables have been confirmed on the basis of a unique longitudinal dataset of UK and New Zealand citizens living in Australia.

The types of such short-term visits examined in this paper are of course also a feature of internal migration, but in that case they remain usually unmeasured and, where they are reported, such as in data in some transportation and tourism studies, the data are unlikely to be available longitudinally. Interestingly, however, our conclusions regarding the relationship between journey distance, travel costs and trip frequency are entirely consistent with a dynamic interpretation of the gravity model, applied either to international or to interregional travel behaviour. Although gravity models themselves have nothing to say regarding the micro-determinants of trip frequencies and individual trip durations in cases of repeat migration, our model goes some way to providing micro-foundations for this. Further avenues for research include the development of more complex optimization models, in which our short-run optimized travel behavior for given endowments and steady-state relationship capital is embedded in a model of the long-run trade-off between the wage-income earned at the location abroad, lifetime consumption and the level of relationship capital maintained at home.

Appendix

Here we provide a geometric explanation of the proposition that, as long as the average curvature of depreciation as a function of time is greater than the average curvature of rebuilding of home country location-tied relationship capital, and these curvatures are not strongly dependent on the initial level of relationship capital, the fraction of time at home h increases in the frequency of trips f and hence $\psi < 1$.

Using Figure 1, we need to show that, when $f > f'$ for a given time horizon Z and the average curvature of the depreciation function exceeds that of the replenishment function, it is likely to follows that $h > h'$. The fractions of time h and h' are given in Figure 1 by $T^H/(T^A+T^H)$ and $T^{H\prime}/(T^{A\prime}+T^{H\prime})$ respectively.

Consider in Figure 1 the case where the functional forms for depreciation $D(P_0,T)$ and for replenishment $R(P_*,T)$ are identical and unrelated to the level of relationship capital, i.e. $D(P_0,T) = D(T) = R(P_*,T) = R(T)$. The curvatures of these functions are then obviously also identical. In this case, the initial replenishment segment can be drawn by taking the mirror image of P_0P^* with respect to the horizontal mirror line at height P_0 and moving the mirror image down until its lowest point at (T^A, P^*). Now, $T^H = T^A$ by construction (time is equally divided between being at home and abroad).

Relationship capital can be maintained at a higher (lower) frequency by the shortening (extending) of the combined "*V*" shape. If the lost relationship capital has to be fully rebuilt (steady state assumption), the time it takes to achieve this continues to be obtained through taking the mirror image and moving it down along the initial depreciation segment, as described above. Hence time continues to be equally divided between home and abroad. This is the general case when $\psi = 1$. Linear depreciation and accumulation with $\alpha = \delta$ (see the main text) is obviously a special case.

However, consider now the case where the depreciation curvature is greater than that of rebuilding, but by construction initially $T^A = T^H$. We continue to assume that depreciation and replenishment are not a function of the initial level of relationship capital. If we now increase the frequency and compare the shorter segment obtained by the same shift of the first depreciation segment as described above with the actual segment of replenishment, we see that more time is needed at home to fully rebuild relationship capital than the time spent abroad, i.e. the fraction of time spent at home will be greater than half. This does not necessarily hold when depreciation and accumulation are a function of the initial levels P_0 and P^* respectively, but as long as the latter effect is not dominant and the average curvature of depreciation as a function of time is greater than the average curvature of rebuilding of home country location-tied relationship capital, at a higher (lower) frequency, $T^H/(T^H+T^A)$ will be greater (less). Figure 1 shows such a case of the curvature of depreciation being greater than that of accumulation, which is consistent with $h > h'$ when $f > f'$ and, given $h = g\ f^{1-\psi}$ according to equation (3), this can only be the case when $0 < \psi < 1$. Section 5 reports estimates of ψ precisely in this range.

The exact way in which ψ depends on relationship capital depreciation and replenishment depends on the curvatures of the functional forms $D(P_0,T)$ and $R(P_*,T)$. With explicit data on relationship capital over time, it may be possible to explicitly consider how ψ is determined by these functional forms. In our case, the steady-state assumption is sufficient to identify ψ statistically. The estimates suggest that depreciation has a greater curvature than replenishment (which could even be linear) but the data do not permit us to estimate these curves separately.

References

BTRE, 2005, *Focus on Regions No. 4 Social Capital*, Bureau of Transport and Regional Economics, Department of Transport and Regional Services, Canberra

Chamberlain, M. and Leydesdorff, S. (2004) "Transnational Families: Memories and Narratives", *Global Networks* 4(3), 227-241.

Constant A and Zimmermann KF (2007) "Circular Migration: Counts of Exits and Years Away from the Host Country", IZA Discussion Paper No. 2999, Institute for the Study of Labor, Bonn.

de Coulon A and Wolff F-C (2005) "Immigrants at Retirement: Stay/Return or 'Va-et-Vient'", CEP Discussion Paper No. 691, Centre for Economic Performance, London School of Economics.

Dollahite, D.C., and Rommel, J.I., (1993), "Individual and Relationship Capital: Implications for Theory and Research on Families", *Journal of Family and Economic Issues*, 14.1, 27-48.

Dustmann, C. (2003), "Return Migration, Wage Differentials, and the Optimal Migration Duration", *European Economic Review* 47(2), 353-367.

Glaeser, E.L., and Kohlhase, J.E. (2004), "Cities, Regions and the Decline of Transport Costs", *Papers in Regional Science*, 83.1, 197-228.

McCann, P. (1993), "The Logistics-Costs Location-Production Problem", *Journal of Regional Science*, 33.4, 503-516.

McCann, P., (2001), "A Proof of the Relationship between Optimal Vehicle Size, Haulage Length and the Structure of Distance-Transport Costs", *Transportation Research*, 35A, 671-693

McCann, P. (2007), "Sketching out a Model of Innovation, Face-to-Face Interaction and Economic Geography", *Spatial Economic Analysis*, 2.2, 117-134.

McCann, P. and Ward, C. (2004), "Real Estate Rental Payments: Application of Stock-Inventory Modelling", *Journal of Real Estate Finance and Economics*, 28.2, 271-290.

Morgan, W., Katz, M., and Rosen, H. (2006), *Microeconomics*, McGraw-Hill, New York

OECD (2006), *International Migration Outlook.* Paris: Organisation for Economic Cooperation and Development.

Shenkar, O., (2001), "Cultural Distance Revisited: Towards a More Rigorous Conceptualization and Measurement of Cultural Differences", *Journal of International Business Studies*, 32.2, 519-35.

Sjaastad, L. (1962), "The Costs and Returns of Human Migration", *Journal of Political Economy*, 70: 80-93.

Statistics New Zealand (2008) Longitudinal Immigration Survey: New Zealand (LisNZ) Wave 1. Wellington: Statistics New Zealand.

Thurber, C.A., and Walton, E., (2007), "Preventing and Treating Homesickness", *Pediatrics*, 119.1, 192-201.

Van Tilburg M.A.L., Vingerhoets, A.J.J.M., and Van Heck, G.L., (1996), "Homesickness: A Review of the Literature", *Psychological Medicine*, 26, 899-912.

West, J. and Graham, L., (2004), "A Linguistic-Based Measure of Cultural Distance and its Relationship to Managerial Values", *Management International Review*, 44.3, 239-260.

World Bank (2006), *Global Economic Prospects: Economic Implications of Remittances and Migration*. The World Bank, Washington DC.

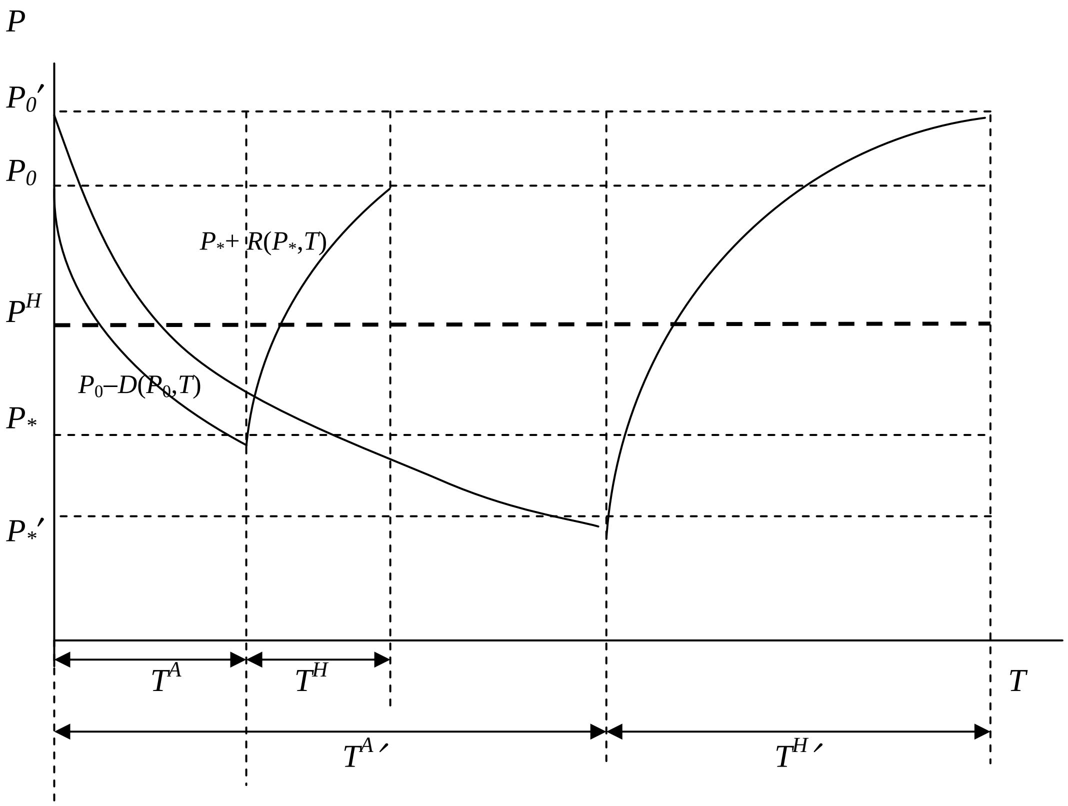

Figure 1. Home Country Relationship Capital Depreciation and Replenishment

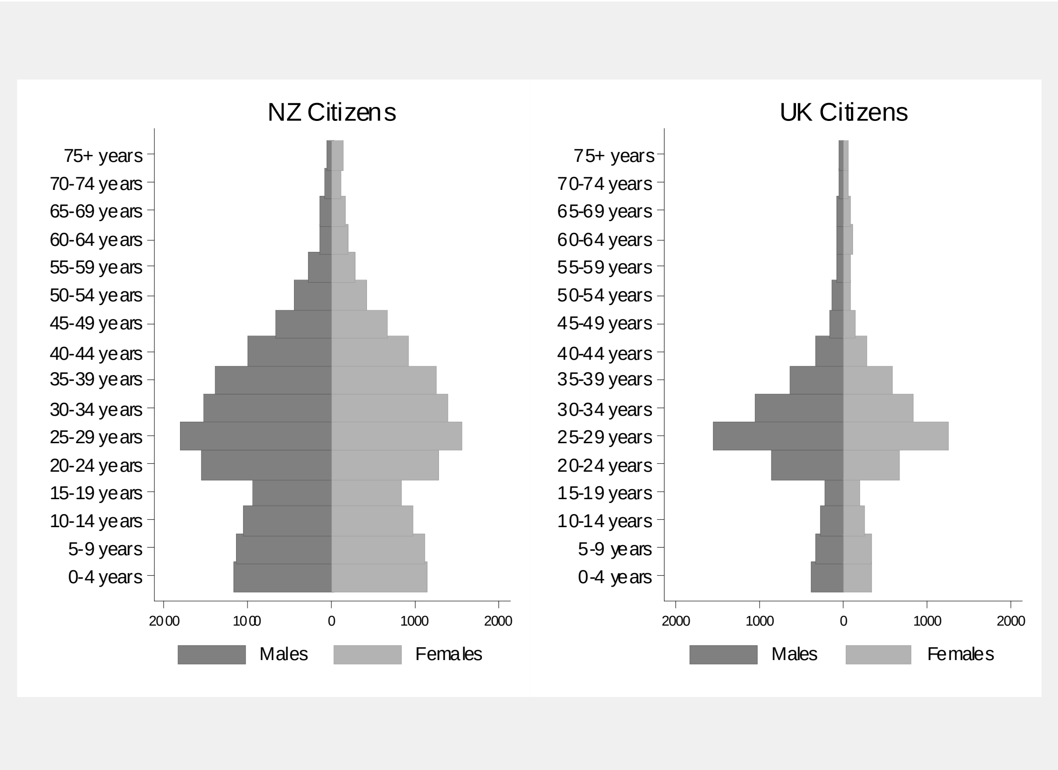

Figure 2 Population Pyramids of the 1999-2000 NZ and UK Permanent and Long-Term migrants to Australia

Table 1 Skill Categories

Skill Category	ANZSCO Occupation Classification
High-skilled	Managers and Administrators
	Professionals
	Associate Professionals
Semi-skilled	Tradespersons and Related Workers
	Intermediate and Advanced Clerical, Sales and Service Workers
	Intermediate Production and Transport Workers
Low-skilled	Elementary Clerical Sales and Service Workers
	Labourers and Related Workers

Table 2 Sample Statistics

	NZ Citizens		UK Citizens	
Mean age (std dev)	34.89	(9.75)	31.92	(7.72)
% female	40.77		40.54	
% non-native born	27.35		5.90	
% high-skilled	44.76		68.74	
% semi-skilled	40.36		27.80	
% low-skilled	14.87		3.46	
% ‘permanent migrants’	68.59		37.61	
% resident in eastern States of Australia	30.28		75.85	
Number	13, 674		6,882	

Table 3 Reasons for Travel

Reason for Travel	**NZ**		**UK**	
	No. of Trips	%	No. of Trips	%
Exhibition	19	0.04	21	0.10
Convention/Conference	609	1.28	397	1.83
Business	3,012	6.34	3,009	13.87
Visiting friends/relatives	17,393	36.52	3,384	15.60
Holiday	8,779	18.48	3,142	14.48
Employment	1,265	2.66	3,656	16.85
Education	105	0.22	212	0.98
Other	809	1.70	444	2.05
Missing	15,523	32.67	7,427	34.24
Total Number of Trips	47,514		21,692	
Number of People	13, 674		6,882	

Table 4 Trip Frequency Distribution over Five Years of Residence in Australia

	p25	p50	p75	p90	p99	Mean	Std. Dev.	Min	Max
NZ Citizens: Total Trips	1	3	5	8	16	3.47	3.63	0	71
UK Citizens: Total Trips	1	2	4	7	16	3.15	3.49	0	40
NZ Citizens: Trips to Visit Family and Friends	0	1	2	3	7	1.27	1.64	0	19
UK Citizens: Trips to Visit Family and Friends	0	0	1	2	4	0.49	0.85	0	10

Table 5 Summary Statistics for Frequency and Duration of Visits to Family and Friends over Five Years of Residence in Australia

	NZ Citizens		**UK Citizens**	
	Mean	Std Dev	Mean	Std Dev
Total Number of Visits (f^*)	2.19	1.62	1.45	0.86
Total Days Away on Visits (h^*Z)	32.33	37.21	37.21	35.08
Average Days per Visit (T^{H*})	16.17	18.30	26.54	23.79
Sample Size	7,959		2,336	

Note: trip frequencies of zero and trip durations of zero have been excluded.

Table 6 Negative Binomial Model of the Number of Trips Visiting Family and Friends

	NZ Permanent Settler			UK Permanent Settler		
Variable	Coef.		Std. Err.	Coef.		Std. Err.
Semi-skilled	-0.308	***	0.023	-0.229	***	0.048
Low-skilled	-0.449	***	0.033	-0.422	***	0.128
Age	-0.032	***	0.008	0.110	***	0.018
Age Squared/100	-0.038	***	0.010	-0.130	***	0.024
Non-native	-0.524	***	0.026	0.022		0.083
Female	0.369	***	0.021	0.352	***	0.041
Eastern State	0.367	***	0.034	0.211	***	0.049
Intercept	0.641	***	0.144	-3.071	***	0.333
Alpha	0.661	***	0.021	0.736	***	0.057
n	13,672			6,881		
Log likelihood	-20723.90			-6415.05		
LR χ^2 (7)	1126.09			178.49		

Significance levels: * : 10% ** : 5% *** : 1%

Table 7 Negative Binomial Model of the Number of Trips Visiting Friends and Family, Comparison of UK and NZ Migrants.

	Coeff.		Std Error
Semi-skilled	-0.308	***	0.023
Low-skilled	-0.449	***	0.033
Age	-0.032	***	0.008
Age Squared/100	0.039	***	0.010
Non-native	-0.524	***	0.026
Female	0.369	***	0.021
Eastern State	0.367	***	0.035
UK Citizen	-3.706	***	0.360
UK * Semi-skilled	0.079		0.052
UK * Low-skilled	0.027		0.131
UK * Female	-0.018		0.045
UK * Non-native	0.546	***	0.087
UK * Eastern State	-0.157	***	0.060
UK * Age	0.141	***	0.020
UK * Age Squared/100	-0.168	***	0.026
Intercept	0.642	***	0.145
Alpha	0.670		0.019
n	20,533		
Log likelihood	-27139.72		
LR χ^2 (15)	178.49		

Table 8 Panel Model Fixed Effects Regression of the Relationship between Total Time Spent Visiting Family and Friends and the Trip Frequency

	Coeff.		Std. Err.
Log Number of Visits	0.415	***	0.023
Second Period Dummy	0.016		0.018
Constant	0.034		0.023
σ_u	0.304		
σ_e	0.344		
ρ (fraction of variance due to u_i)	0.439		
n	2,452		

Note: The sample consists of labor migrants making at least one visit home per 2.5 year sub-period

Table 9 Comparison of the Elasticities of Total Time Visiting Family and Friends with Respect to Travel Frequency

	Coefficient	$\hat{\psi}$	*t* Stat	*N*
All	0.415	0.585	18.06	1,226
NZ-born NZ Citizens	0.398	0.602	14.56	823
NZ-born NZ Citizens in Eastern States	0.380	0.620	13.23	761
NZ-born NZ Citizens in Western States	0.568	0.432	5.54	102
UK-born UK Citizens	0.567	0.433	8.97	193
Males	0.416	0.584	11.69	533
Females	0.414	0.586	13.73	693
High-Skilled	0.383	0.617	12.95	685
Semi-Skilled	0.462	0.538	10.67	356
Low-Skilled	0.424	0.576	5.64	117
<35 years old	0.398	0.602	14.01	789
≥35 years old	0.441	0.559	11.33	437

Note: Estimates are based on the fixed effect estimator in a two period panel model. A time dummy was included (but not statistically significant). Migrant characteristics were approximately time invariant over the period considered and therefore did not enter the fixed effects regression. For UK citizens, the sample was too small to obtain estimates for those residing in Eastern and Western States separately.

Table 10 Propensity to Visit Relatives and Friends in Relation to Subsequent Re-Migration Behavior

	NZ Citizens		**UK Citizens**	
	Mean	*N*	Mean	*N*
Stayed until July 2005	0.359	13,674	0.105	6,882
Standard Deviation	(0.660)		(0.352)	
Re-migrated after January 2003	0.599	2,302	0.118	1,186
Standard Deviation	(0.925)		(0.362)	
Stayed until July 2005, and intended to stay	0.345 (0.644)	9,379	0.193 (0.450)	2,588
Stayed until July 2005, and intended to remigrate	0.388 (0.692)	4,295	0.073 (0.287)	4,294

Note: Labor migrants only. The propensity is measured by the fraction of migrants who made at least one visit to relatives and friends over the first 2.5 years period, i.e. between 1 August 2000 and 1 February 2003. Standard deviations in parentheses.