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Oded Stark, C. Simon Fan

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The Analytics of Seasonal Migration

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Center for Development Research
Walter-Flex-Strasse 3
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Germany
Phone: +49-228-73-1861
Fax: +49-228-73-1869
E-Mail: zef@uni-bonn.de
http://www.zef.de

The authors:
Oded Stark, Center for Development Research (ZEF), University of Bonn, Bonn, Germany (contact: ostark@uni-bonn.de).
C. Simon Fan, Lingnan University, Tuen Mun, Hong Kong (contact: fansimon@ln.edu.hk).

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Abstract

A framework that yields different possible patterns of migration as optimal solutions to a simple utility maximization problem is presented and explored. It is shown that seasonal migration arises as an optimal endogenous response to a comparison of costs (of living and of separation) and returns (to work) over a set of three alternative options, even if a year-long migration is feasible.

Kurzfassung

Das vorliegende Papier präsentiert einen Ansatz, der verschieden mögliche Migrationsmuster als optimale Lösungen zu einem einfachen Nutzenmaximierungsproblem erzeugt. Es wird gezeigt, dass bei der Auswahl aus drei Optionen, basierend auf einem Vergleich von Kosten (Lebenshaltungskosten und Trennungskosten) und Erträgen (Arbeit), die saisonale Migration eine optimale endogene Strategie ist, sogar dann, wenn eine ganzjährige Migration möglich ist.

1 Motivating Examples

Seasonal migration occurs in many settings, both interregionally and internationally. While the Polish-German setting constitutes our first motivating example, the theory developed in this paper is applicable to migration between developing countries in general. Initially this paper was motivated by an observation and a question. The observation: the prevalence of a large-scale, strictly-regulated seasonal migration from Poland to Germany. The question: will Poland's accession to the EU on May 1, 2004, after the gradual elimination of the administrative constraints on the types of migration allowed into the "old" EU member states, result in the seasonal migration flows being replaced by a permanent migration tide? Put differently, could it be that Poles optimally choose to migrate for short spells of time because such migration confers a higher net benefit than other forms of migration?

In 2004, Germany was (still) the lead destination country for migration from Poland. Currently, the main migratory outflow from Poland is short-term work. Polish seasonal migration for work for a maximal period of three months a year constitutes a striking example of this form of outflow. In 2004, approximately 307,000 work permits were issued for seasonal work in Germany, as compared to 292,000 in 2003, and 131,000 in 1992 (Kępińska, 2004). Okólski (2001) labels seasonal migration from Poland "incomplete migration", points out that "migrants increasingly (…) focus on one particular aim: namely earning money in the host country and spending it in the home country", and characterizes "mobility of this kind [as] a split living set-up, with economic activity pursued largely in the host country and family life taking place predominantly in the home country" (pp. 105, 109).

The constraints on all forms of migration, including seasonal migration, into the 15 pre-accession member states of the EU will be removed once the transitional period for work in these states ends, which in the case of Germany is scheduled for 2011. Will the seasonal, temporary migration outflow be transformed into a permanent outflow in 2011? When the administrative upper limit on the duration of migration is removed, will individuals optimally choose permanent migration? Permanent migration by themselves? Permanent migration together with their families? More generally, governments of rich countries often express a concern: will opening

the economy to seasonal migration from poorer neighboring countries entail, with a lag, opening the economy to permanent migration?

We seek to shed light on these questions by developing a simple analytical framework. We find that the seasonal temporary outflow has its own internal logic and will therefore not necessarily be replaced by other forms of migration. Individuals for whom a configuration of parameters as described below yields a preference for seasonal migration are not latent permanent migrants.

Mexican workers are allowed to migrate seasonally to Canada under administrative constraints that are similar to those that govern Polish - German seasonal migration. Moldovan workers migrate seasonally to Russia and to other East European countries, and workers from Burkina Faso migrate seasonally to Cote d'Ivoire. However, the analysis conducted in this paper is distinct from the usual thinking on seasonal migration in two main respects. First, we do not consider rural-to-rural seasonal migration that is essentially induced by the peak planting and harvesting activities in one village coinciding with the lull agricultural period in another village, and vice versa. Second, we do not consider the important issue of the *timing* of migration; our interest is in the *duration* of migration. Clearly, the opportunities to engage in seasonal migration can be and often are linked to the cyclical nature of sectoral activity – the seasonality of the tourism industry constituting an obvious example. We implicitly show that even if the demand for migrant work does not fluctuate, individuals optimally choose to curtail the duration of their migration, to engage in a seasonal rather than permanent form of migration. Taking rural-to-urban migration as an example, it is the fact that urban prices are higher than rural prices which makes it advantageous to separate place of work from place of consumption, and it is the tension arising from separation from the rural family which places a limit on the length of separation.

2 Introduction

The duration of migration may be shorter than a year. In this case, we refer to it as "seasonal". A major reason for migration being seasonal is an exogenously-imposed constraint: migrant workers are not allowed to stay longer than a given length of time (work permits are of limited duration). This paper demonstrates that it may be optimal for workers to *choose* seasonal migration. In section 3 we show that seasonal migration arises as an optimal endogenous response to a comparison of costs and returns (over a set of three alternative options), even if a year-long migration, which for ease of reference we label "permanent", would have been feasible; seasonal migration may not be a reluctant response to an exogenously-imposed administrative constraint on the duration of migration. If permanent migration is feasible *and* optimal, it can take two forms: "permanent alone", and "permanent with the family". We present and explore a framework that yields different possible patterns of migration as optimal solutions to a simple utility maximization problem. We highlight the key parameters that demarcate the relevant plain into three mutually exclusive and jointly exhaustive regions that correspond to the three migration options: "seasonal alone"; "permanent alone"; and "permanent together".

3 An Analytical Framework

Consider a family with one breadwinner. We focus on the welfare of the breadwinner's family. We assume that the breadwinner is altruistic towards his family. To concentrate on essentials, we assume away the breadwinner's own consumption (excluding it from the utility function that follows). When the breadwinner's basic needs of food and accommodation are provided by the foreign employer, when the breadwinner's family is large, and when his altruism towards his family is strong, such an assumption is quite appealing. Put differently, in line with the "New Economics of Labor Migration" (Stark, 1993), we view the breadwinner as an agent who migrates on behalf of his family in order to maximize the wellbeing of the family. We do not assume away, however, the breadwinner's pain of separation from his family nor the family's pain of separating from the breadwinner, which could be quite costly. (An altruistic breadwinner does take into account the cost imposed by his absence on members of his family who stay behind.) Below, we will not only assume that the cost of separation rises in the duration of the separation, we will also assume that it becomes increasingly difficult for the breadwinner and his family to sustain the separation as its duration lengthens.

Let the breadwinner's utility function be

$$u = u(C,S) = C - S \tag{1}$$

where "C" denotes the consumption of the breadwinner's family, and "S" denotes the cost of the breadwinner's separation from his family upon his migration.

In the following analysis, we normalize the breadwinner's single-year time as 1. There are two countries, say Germany, G , and Poland, P. The wage rates in Germany and in Poland are denoted by R_G and R_P, respectively.

We first consider the case of the breadwinner working in Germany while leaving his family behind in Poland. Thus, if the breadwinner spends *t* fraction of his unit endowment of time working in Germany, and 1-*t* working in Poland,[1] then his total earnings are

$$R_G t + R_P (1-t)$$

The price level in Germany is higher than in Poland. We normalize the price level in Poland as 1, and we denote the price level in Germany by $P_G > 1$. We assume that

$$\frac{R_G}{P_G} > R_P \tag{2}$$

This assumption means that the breadwinner's real income is higher in Germany than in Poland. Consequently, given (1), the possibility that the breadwinner will stay with his family in Poland for his entire work time is immediately ruled out. Had he done so, his earnings would have been R_P which, from (2), are strictly less than the earnings that he would have been able to draw from migration to Germany along with his entire family, which in turn, from (1), would have yielded $u = C = \frac{R_G}{P_G}$.[2]

The consumption of the breadwinner's family is equal to the breadwinner's total earnings, namely to

$$C = R_G t + R_P (1-t) \tag{3}$$

We assume that

$$S = \theta t^2 \tag{4}$$

Since the cost of separation may differ across breadwinners, we further assume that θ is a random variable with a probability distribution in the domain (0,∞). Furthermore, we not only

[1] For the sake of clarity, we do not consider in this section the impact of the presence of an administrative constraint on the duration of the work period in Germany. We explore however such an issue in the Appendix.

[2] In an early version of this paper we showed that if we slightly modify the formulation of the utility function in (1) by reinterpreting "*C*" as the family's average level of consumption during the year, and if we assume that the family has a strong "consumption smoothing motive" as emphasized by the Life Cycle - Permanent Income Hypothesis, then equation (2) can also serve to exclude the possibility that the entire family will distribute its time between the two countries and consequently, consume in both.

assume that the cost of separation rises in the duration of separation, we also assume that it becomes increasingly difficult for the breadwinner and his family to sustain the separation as its duration lengthens.

Inserting (3) and (4) into (1) yields

$$u = R_G t + R_P (1-t) - \theta t^2 \tag{5}$$

Suppose that the optimal solution to (5) is interior. Then, from the first-order condition,[3] we get that the optimal choice of t, t^*, is

$$t^* = \frac{R_G - R_P}{2\theta}$$

Since $R_G - R_P > 0$, we always have that

$$t^* > 0$$

Hence, seasonal migration occurs if and only if t takes an interior solution, namely if and only if

$$t^* = \frac{R_G - R_P}{2\theta} < 1 \tag{6}$$

or if and only if

$$\theta > \frac{R_G - R_P}{2} \equiv \theta^* \tag{7}$$

That is, seasonal migration occurs if and only if $\theta > \theta^*$. In this case, inserting (6) into (5) and rearranging, we get that the breadwinner's utility is

$$u_s^* \equiv \frac{(R_G - R_P)^2}{4\theta} + R_P \tag{8}$$

If, however, $\theta \le \theta^*$, then the breadwinner will choose permanent residence in Germany (with complete separation from his family) rather than seasonal migration. In this case, upon inserting $t = 1$ into (5), we get that the breadwinner's utility is

[3] The second-order condition for a maximum holds: $-2\theta<0$.

$$u_p^* \equiv R_G - \theta \tag{9}$$

We next consider the possibility that the breadwinner migrates to Germany along with his entire family. In this case, neither the breadwinner nor his family will incur any cost of separation since the breadwinner is continuously with his family. Then, as explained earlier, and noting (1), we get that the breadwinner's utility is

$$u_m^* \equiv \frac{R_G}{P_G} \tag{10}$$

It follows then that if $\theta \leq \theta^*$, the breadwinner will choose permanent residence in Germany (with complete separation from his family) rather than migrating along with his entire family to Germany, if and only if

$$R_G - \theta > \frac{R_G}{P_G} \tag{11}$$

Alternatively, if $\theta > \theta^*$, then the breadwinner will choose seasonal migration rather than migration along with his entire family if and only if

$$\frac{(R_G - R_P)^2}{4\theta} + R_P > \frac{R_G}{P_G} \tag{12}$$

From both (11) and (12), we see that the smaller θ (that is, the less costly the separation) and the greater P_G (that is, the more expensive it is for the entire family to live in Germany), the less likely that the inequalities in (11) and (12) will be reversed, that is, the less likely it is that the breadwinner will migrate along with his family to Germany.

Conditions (11) and (12) can be usefully illustrated with the help of Figure 1.

In the Figure, we divide the plain (θ,PG) into three regions associated with the three options facing the breadwinner: (1) "seasonal alone" migration; (2) "permanent alone" migration

– working and living alone in Germany throughout the entire year; (3) "permanent together" – migrating to Germany for the entire year along with the family. Clearly, the three regions are demarcated by a straight line and two curves. The straight line is given by

$$\theta = \theta^* \tag{13}$$

The two curves are characterized by the following two equations:

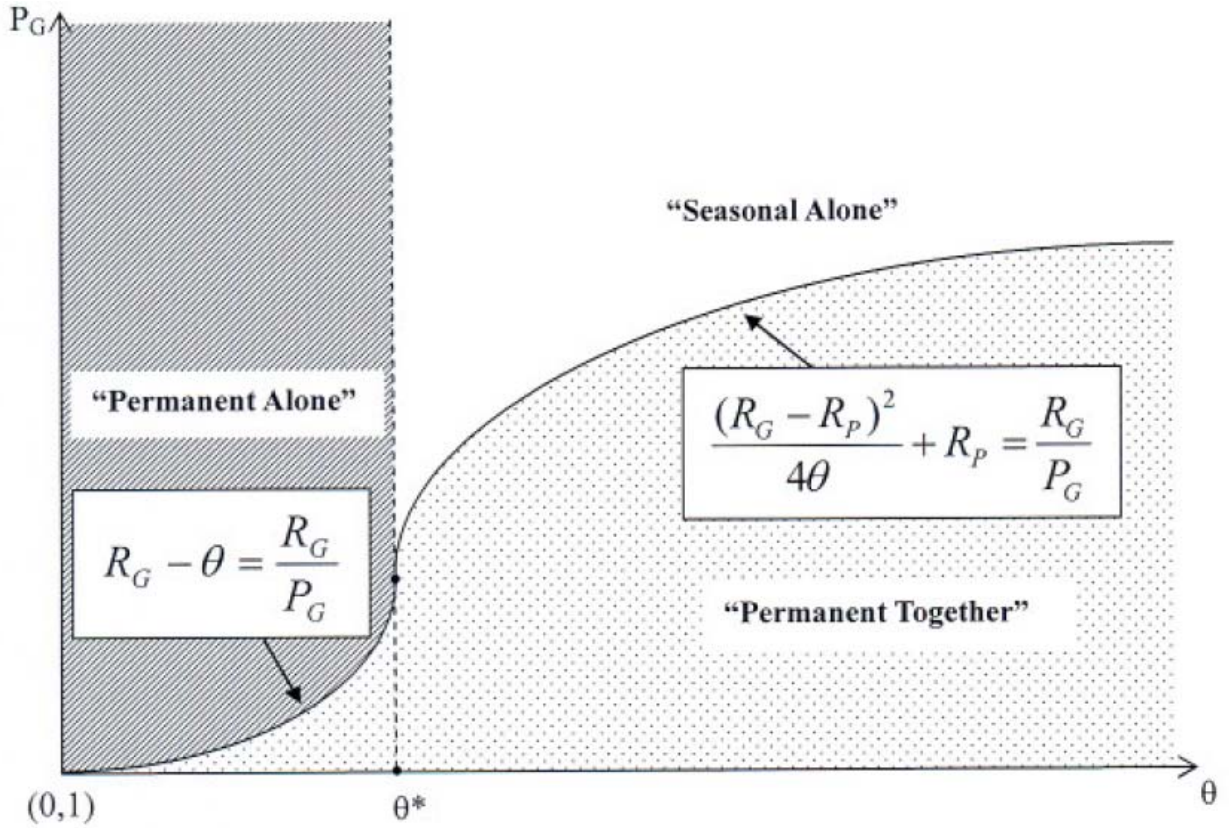
(i) If $\theta \leq \theta^*$

$$R_G - \theta = \frac{R_G}{P_G} \tag{14}$$

(ii) If $\theta > \theta^*$

$$\frac{(R_G - R_P)^2}{4\theta} + R_P = \frac{R_G}{P_G} \tag{15}$$

Figure 1: Optimal Patterns of Migration



Referring first to the first curve, upon totally differentiating (14) with respect to P_G and θ and rearranging, we get

$$\frac{dP_G}{d\theta} = \frac{R_G}{(R_G - \theta)^2} > 0 \tag{16}$$

Hence

$$\frac{d^2P_G}{d\theta^2} = \frac{2R_G}{(R_G - \theta)^3} > 0 \tag{17}$$

In Figure 1, the vertical axis denotes P_G (starting at P_G=1) and the horizontal axis denotes θ. Then, from (16) and (17), we know that the curve defined by (14) is increasing and that it is convex.

Referring next to the second curve, upon totally differentiating (15) with respect to P_G and θ and rearranging, we get

$$\frac{dP_G}{d\theta} = \frac{R_G(R_G - R_P)^2}{4} / [\frac{(R_G - R_P)^2}{4} + R_P\theta]^2 > 0 \tag{18}$$

Hence

$$\frac{d^2P_G}{d\theta^2} = -\frac{R_P R_G(R_G - R_P)^2}{2} / [\frac{(R_G - R_P)^2}{4} + R_P\theta]^3 < 0 \tag{19}$$

Thus, from (18) and (19), we know that the curve defined by (15) is increasing and that it is concave.

The Figure nicely illustrates the *interplay* between the coefficient of the cost of separation, θ, and the cost of living (price level) in Germany, P_G, as a determinant of the optimal pattern of migration. As indicated by the grey area, for low values of θ (that is, when separation costs little), the breadwinner chooses "permanent alone" migration even if P_G is not very high. The blank area describes a combination of θ and P_G that leads the breadwinner to choose "seasonal alone" migration; compared with the grey area, separation is costlier. In this blank area, a relatively costly separation and a high cost of living in Germany combine to prompt migration without the family, but not a permanent migration. If the cost of living in Germany is relatively low (that is, P_G is relatively small), then the breadwinner will choose "permanent together"

migration, illustrated by the dot-shaded area. A high cost of living in Germany also leads to a "permanent together" migration if separation is considerably painful. The breadwinner's choice is more likely to fall into this dot-shaded area for higher values of θ, although the choice is also likely to be "permanent together" for lower values of θ if P_G is sufficiently small.[4]

[4] Our analysis can be extended straightforwardly to migration patterns over the duration of an individual's working life. We could re-label "seasonal" as "partial" – meaning non-permanent – and refer to migration for less than working life as "temporary". We will then normalize the duration of working life as 1, and replace "year" with "lifetime". Our analysis will then yield a set of patterns of migration over the individual's lifetime.

4 Conclusion

The phenomenon of seasonal migration in which the consumption of a migrant and particularly of his family members occurs mainly in the home country and in which there is "seasonal" separation between the migrant and his family members has not been researched extensively. We have presented a framework that yields seasonal migration as an optimal form of migration, and we have identified key variables that impinge on the decision to engage in seasonal migration. In a companion paper (Stark, Fan, Kepinska, and Micevska, 2006) we subject key implications of the analytical framework to empirical scrutiny. Drawing on two data sources we find that, in line with the theoretical argument, the cost of living differential and the cost of separation shape seasonal migration outcomes to a significant degree.

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Appendix

As mentioned in Section 1, currently there is an administrative constraint on the length of time worked in Germany. In this Appendix we examine how this constraint affects seasonal migration, as well as how its future elimination will affect seasonal migration.

We denote the administrative upper limit on the length of time worked in Germany by α ($0 < \alpha < 1$) in terms of the fraction of the breadwinner's unit endowment of time. Then, following the logic of the analysis in Section 3, seasonal migration occurs if and only if *t* takes an interior solution, namely if and only if

$$t^* = \frac{R_G - R_P}{2\theta} < \alpha \tag{A1}$$

or if and only if

$$\theta > \frac{R_G - R_P}{2\alpha} \tag{A2}$$

Now, we denote the probability distribution function of θ by $F(\bullet)$. In this Appendix, where we explicitly admit the administrative upper limit on the length of time worked in Germany, we define seasonal migration as occurring when a breadwinner voluntarily spends in Germany less time than is allowed by the German authorities. Then, the proportion of households in Poland whose breadwinners engage in seasonal migration is given by

$$1 - F(\frac{R_G - R_P}{2\alpha}) \tag{A3}$$

After the elimination of the administrative constraint on the duration of migration from Poland into Germany, the proportion of households whose breadwinners engage in seasonal migration will be given by

$$1 - F(\frac{R_G - R_P}{2}) \tag{A4}$$

Hence, since

$$\begin{aligned} & 1 - F\left(\frac{R_G - R_P}{2}\right) - \left[1 - F\left(\frac{R_G - R_P}{2\alpha}\right)\right] \\ & = F\left(\frac{R_G - R_P}{2\alpha}\right) - F\left(\frac{R_G - R_P}{2}\right) \\ & > 0 \end{aligned} \tag{A5}$$

the elimination of the administrative constraint will result in an *increase* in seasonal migration.

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