Another partition?
Perceptions of uncertainty and emigration from Kazakhstan to Russia 1999-2007

Galina An
Department of Economics, Kenyon College
ang@kenyon.edu

Charles M. Becker
Department of Economics, Duke University
cbecker@econ.duke.edu

Abstract: Antedating but increasing with the dissolution of the USSR, there has been an enormous separation of populations within the former Soviet republics, with people returning to those nations in which their nationality is dominant. However, in the 1990s these flows were largely overshadowed by the consequences of relative economic collapse, which resulted in employment-based migration. During the past decade, stabilization has returned, and some countries – notably, Kazakhstan and Russia – have enjoyed rapid economic growth. Thus, it now possible to explore different motivations for migration, including political efforts to achieve ethnic partitions, migration in search of higher expected earnings and benefits, and migration in search of stability and less risky environments. We address these questions using a panel grouped data set on net migration between Kazakhstan and Russia for the periods 1999-2007. Standard migration literature results obtain: working age people appear to seek higher expected earnings and move to areas with employment growth. However, predominately Slavic regions do not have higher emigration rates, controlling for demographic and economic environment. Most importantly, there appears to be a flight from risk in earnings and exchange rates.

This paper has benefited from comments during a seminar at the Caucasus Research Resource Center in Baku, and at the Koc University/ACC conference on Eurasia in a Shifting Global Context. We also thank Gracia Sierra for invaluable advice.

I Introduction

There are many reasons to migrate from one region to another or emigrate to a new country. The conventional stories, implicitly phrased in a world of certain outcomes or expected income maximization, emphasize labor market adjustment, with individuals moving from low-income to high-wage locations. The importance of higher expected earnings in motivating migration behavior has received vast empirical support; it also has been augmented by studies of other motives, especially for those who are not young working-age adults (Becker and Morrison, 1999). These additional motives include tied, or derived, migration (children, aged parents, and secondary workers accompanying primary workers, and migration in search of improved amenities (educational opportunities, climate, "quality of life"). The search for security also influences migration decisions, ranging from physical security (fleeing crime and violence; in the extreme leading to ethnic partition) and the search for political and religious freedom from persecution, to the more mundane desire to avoid risky economic environments.

Which forces predominate will depend on the circumstances under investigation. In stable, high income countries, the search for amenities (better schooling and nicer environment) and security (lower crime risk) are important migration factors. This is especially true for intra-metropolitan area movements, since employment and earnings may well be unaffected. Thus, one finds suburbanization at times as middle and upper income families leave poor, crime-ridden inner city areas; at other times, there is growth in the urban core as childless young professionals move to social and cultural amenities generated only in city centers. Not surprisingly, there is virtually no emigration for these reasons, and little if any no movement from one metropolitan area to another among the working-age population. Rather, these larger moves are driven more by job considerations – though, in rich countries, amenities matter to all groups.

In high income countries, it is also generally the case that inflation is relatively low and economies are relatively stable. While it is possible that there is substantial variation in earnings for a given set of skills and demographic attributes *within a given location*, it is generally accepted that markets work well. In that case, markets "clear" and, if properly measured, variation in nominal earnings should be small. Low inflation means that variation of the purchasing power of earnings also should be small. Thus, uncertainty in outcomes should not be an important migration factor.

In poor, middle income, and transition countries, personal safety and economic security may be far more important. Many countries have experienced partial or complete ethnic partition, flight from crime can be a serious consideration, and repressive, corrupt, or manifestly incompetent states may provoke mass migration. Markets also tend to be weaker and macroeconomic policy and conditions are more variable than in rich countries. Therefore, uncertainty as to both earnings and their purchasing power may be important in migration decisions.

Economic theory predicts that reducing uncertainty will be an objective of migration. Specifically, assuming a quasi-concave utility function and expected utility maximization a la von Neumann-Morganstern, then migration decisions will depend on higher moments of wealth/income as well as differences in expected values. Migrants will seek locations that offer higher wages and lower earnings variance, either at a given point in time, or over one's lifetime.

However, while this point is made clearly by a range of theoretical models, there is virtually no empirical study of the importance of uncertainty in migration choices. The reason for this is straightforward: it is not easy to generate an indicator of uncertainty, especially in a non-static sense – and it is likely that temporal variation in outcomes is the most important source of (in)stability, especially in countries that have undergone huge shocks, or that have weak governments.

This paper seeks to address that void, albeit using grouped data. We take advantage of an extraordinary dataset that gives quarterly net and gross migration from Kazakhstan to Russia from 1999 through 2007, with observations delineated by region (oblast), age group, and gender. As is discussed at length below, there is reason as well to believe that these data are fairly accurate, and they are also reconciled between the countries. The USSR had a strict internal passport (propiska) system that mandated official registration for all permanent moves. While there is no difficulty today in securing permission to relocate, and while in practice migration from one USSR successor state to another is not difficult, those moving are still required to register. Social services are not provided to immigrants who do not register; on the other hand, those who do (especially if of the titular nationality) tend to receive supplemental support. Persons leaving Kazakhstan who were employed in formal sector activities, and hence who accumulated individual pension accounts, had a strong incentive to register upon departure as well, since they were then able to cash in their pension savings. As we also have information on the ethnic composition of migration, emigration from Kazakhstan to Russia provides an excellent opportunity to explore the relative importance of migration for all of the reasons mentioned, and in particular to gauge the importance of ethnic partition and economic security on net migration.

We find that economic uncertainty is indeed a potentially important deterrent to migration, with variance comparable in terms of magnitude of effect to differences in means of economic variables. Standard economic considerations are critical, especially for younger adults. But, both uncertainty and skewness of average wage and exchange rate distributions matter, and deter emigration. In contrast, we do not find evidence that regions of Kazakhstan with large ethnic Russian populations had higher emigration. Correcting for demographic structure, and economic and social environments, ethnic composition does not appear to predict migration rates (even though omitted variables bias would, if anything, push it toward significance). This finding is weak evidence against the partition hypothesis view that, following the collapse of the USSR, ethnic groups were destined to segregate, with each large group gradually returning to the republic in which it was the dominant population. The reason for the weakness of the finding is that our estimates are based on first differences, and it is possible that differences in ethnic composition affect levels, but not differences. Thus, our core conclusion is that economic uncertainty matters – and, quite possibly, absence of uncertainty measures lead to biased results in earlier studies.

The remainder of this paper begins with an overview of the migration literature and the role of economic uncertainty, as well as a discussion of prior empirical work on migration in Kazakhstan and Russia. Section III discusses migration patterns, while Section IV sketches a formal model and the following section addresses econometric issues. Results are presented in Section VI; an assessment of the importance of economic uncertainty then follows.

II Previous studies

Awareness of the importance of higher moments in migration dates to the 1980s. Among the seminal work is that of Banerjee and Kanbur (1981), who explore rural-urban migration in India. Building on Todaro (1969), in their model migration depends on the riskiness of finding an urban job; rural income certainty is assumed (despite a lack of evidence on this point). Expected utility maximization leads to a location choice model in which migration to cities depends positively on expected wage, and negatively on perceived income variance. But, while the theory is clear and elegantly presented, the grouped data from India offered little, and the Banerjee-Kanbur risk measure essentially amounts to nothing more than an unemployment odds ratio for the entire urban labor force in each state. The sign on this term matters as expected, but others had already used unemployment rate in a more *ad hoc* manner, while a myriad of others provide a range of alternative explanations for the importance of unemployment.. These include Harris and Todaro (1970) and Todaro (1969; also see Blomqvist, 1978) to Stiglitz (1969, 1974, 1976) to Knight and Sabot (1990) Worse, these alternatives are either observationally equivalent, or imply an endogeneity problem.

The Todaro framework is further expanded by Katz and Stark (1986), who note that migration may occur even if destination expected income is lower than origin income. They carefully delineate the assumptions on individual behavior necessary for rural-urban migration, and find that migration may be spurred by a "small chance of reaping a high reward;" migration also depends on the nature of capital markets, which do not figure in earlier models. Risk-hedging behavior in location choice receives strong empirical backing from Rosenzweig and Stark (1989). They explore marriage patterns in rural Indian villages, finding that unions are formed in part to reduce overall family risk (as brides go to villages with imperfectly correlated rainfall patterns).

Shortly before Banerjee and Kanbur's paper, an even more elegant theoretical construction was published by Smith (1979). Ironically, Banerjee and Kanbur appear to have been unaware of Smith, who in turn was unaware of the development migration literature emerging from Harris and Todaro. Smith offers no empirical assessment, but explores several theoretical issues, and concludes that individuals with different preferences over risk should self-segregate geographically.

More recently, O'Connell (1997) distinguishes two types of uncertainty: static uncertainty associated with stochastic outcomes at present (uncertainty over current conditions), and uncertainty over future values. In this setting, initial variance may actually encourage "try your luck" migration, with winners then staying and losers returning home. That would not be the case if migration costs are high or if wages are likely to evolve. The second type of uncertainty encourages "wait and see behavior." Wang and Wirjanto (2004) formalize this further, exploring migration in a setting in which both origin and destination wages are characterized by Brownian motion. Their model predicts that greater destination uncertainty will deter migration.

Several other recent papers also have explored the role of risk and uncertainty in the migration decision. Chen, Hwan, and Leung (2003) build on Katz and Stark, and formalize conditions under which migration may be optimal for a family, even if destination wages are on average lower, and even if destination conditions are on average riskier. This family emphasis builds on the classic work of Stiglitz(1969).

Virtually the only empirical work we have identified that is remotely similar to ours is Anam, Chiang, and Hua (2008), who model family migration strategies for individual members under uncertainty in a two period model, and test the model using data on Canadian immigration from Hong Kong. They identify both option and portfolio motives that influence migration timing. If everyone eventually migrates, then uncertainty may simpley weaken the link between current wages and migration, and also may make earnings differences less important overall in the migration decision. Their empirical analysis is largely descriptive, though, and they do not seek to derive a measure of perceived riskiness of migration (or remaining in Hong Kong). Finally, it is worth noting that Tsegai (2007) emphasizes the risk-reducing role of education in exploring migration within Ghana. In summary, there is ample theoretical reason to believe that uncertainty is critically important in the migration decision, but there have been almost no attempts at empirical verification.

The importance of physical security in inducing migration has received more attention. Not surprisingly, this personal safety and related ethnic partition as a motive tends to be explored by demographers and political scientists rather than economists. Brubaker (1998) analyzes ethnic-based flows that accompanied the downfall of communism in the USSR and Eastern Europe. His paper sets the stage for the analysis here. Beyond lamenting the lack of "good data on the Russian reflux to

Russia" and describing in broad terms the significant ethnic repatriation that has taken place, Brubaker emphasizes the uncertainty as to whether these movements reflect economic motives, psychological impulses, or genuine fear of ethnically-directed violence or discrimination.

The numerically vaster population flows that accompanied the separation of British India into independent India and Pakistan are explored by Bharadwaj, Khwaja, and Mian (2008a, 2008b). Their more recent paper includes the results of district-wide regressions: while individual information is not available, pre- and post-partition Census data indicate that those migrating were disproportionately likely to be literate, female, and engaged in non-agricultural occupations – relative both to the populations of origin and destination.

Finally, there is a considerable literature on fear of violence and migration in the Latin American context. Grun (2009) assesses past studies, and formulates an intertemporal model of migration and, simultaneously, savings decisions. Her model unambiguously predicts that migration likelihood will increase with violence and decrease with higher savings; savings, in turn, are deterred by violence, and also decline with an individual's discount rate. Micro data from Colombia are used to test the model; briefly, the results from bivariate Probit regressions correcting for selection are supportive of the underling model. A limitation of all security-motive studies from our perspective is one cannot determine whether levels of fear or uncertainty over events is driving outcomes, or both – and they are surely correlated.

Turning to migration within the former Soviet Union, there have been several studies of inter-regional migration in Russia (most notably, Andrienko and Guriev 2004, Fidrmuc 2004, Heleniak 1999, Rowland 2001, and Zaionchkovskaya 1996). The most rigorous of these studies, Andrienko and Guriev, find standard push-pull and distance effects on migration flows; they also find that lack of financial resources constrains outmigration. They explore aggregate migration flows using pooled cross-oblast data from 1992-1999, using a fixed effects specification with instruments for unemployment and per capita income. The implicit model, as with most other empirical studies, is that of gradual response to an ongoing disequilibrium, since migration flows are regressed on a vector of explanatory variable levels. Lags are not explored, and the low frequency (annual) data do not allow exploration of the adjustment process. Given this caveat, and also noting that recorded internal migration in Russia is low by, say, American standards, the flows are consistent with a model in which Russians tend to leave low income, high unemployment regions with poor services.

Becker *et al.* (2003, 2005) explore the determinants of migration from Kazakhstan to Russia, using monthly data from 1995-1999. Using a seemingly unrelated regressions (SUR) system, they examine the determinants of migration among different age groups in an explicitly disequilibrium context. They find evidence of different lag durations and different sensitivities across demographic groups. In general, push and pull forces operate as expected. Young adults are most sensitive to conventional economic forces, but older age groups respond as well. Loud, clear signals have larger (proportionate) impacts than softer ones: they find evidence of a threshold effect in that a Russian crisis (August 1998) dummy has an impact above the changes that occurred in other explanatory variables.[1]

At the individual level, Agadjanian, Nedoluzhko, and Kumtsov (2005, 2008) utilize data drawn from a pilot survey of 1535 individuals in Kyrgyzstan's northern regions of Bishkek (the capital city), the Chui valley, and Issyk-Kul. They fit logistic time-to-maturity of migration intentions regressions. An obvious emphasis is on ethnic differences, as well as gender differences, contacts, and social capital (extent of integration in one's home community) impacts. In particular, they identify different migration-marriage-fertility strategies, and explore how these affect migration plans. However, endogeneity issues are not addressed, and several variables are simultaneously determined. They find large differences between Asian and European youth with respect to migration intentions: Europeans are more likely than Asians to choose permanent over temporary migration, family over non-family migration. However, differences between temporary *vs.* no migration and individual *vs.* no migration are fully explained by other factors. Gender appears to matter little between or across ethnic boundaries, including decisions for temporary *vs.* permanent and family *vs.* individual migration. However, being married increases the maturity of migration intentions among Europeans, but not Asians (nearly all of Kyrgyz ethnicity). Having a child has an overall negative effect on migration intentions, but is significant only among Asians. Possession of migration-related social capital both at potential destinations and in places of current residence strengthens migration intentions, and increases proclivity to migrate permanently and to do so with family members. Having relatives abroad is associated with preference for permanent over temporarily migration and for family-based over individual migration, especially among Asians. Perceived family material well-being does not have a differential impact on Asian and European migration intentions.

[1] The Russian-language literature on migration, largely from a sociological perspective, is surveyed in Andrienko and Guriev (2004) and Becker *et al.* (2005).

However, the expectation of improving conditions in community of residence is found to more strongly affect Asians' migration intentions. In general, anticipated improvement in living conditions discourages permanent migration among Europeans and temporary migration among Asians (for whom permanent migration intentions are quite limited). Expectations about the short-term economic future of Kyrgyzstan concerned mainly Europeans, while prospects for the respondent's ethnic group show no association with migration intentions. Overall, their research does not detect any effect of ethno-political discontent on the propensity to emigrate.

To summarize the extent of our knowledge to date, it is fair to claim that conventional economic and amenity factors are important in driving migration patterns within the former Soviet Union. It appears that migration flows respond quickly to information about economic differences, or at least they did during the chaotic period of the 1990s. Whether that remained the case during the past decade of rapid economic growth in Russia and Kazakhstan is unclear. Also unresolved is the relative importance of ethnic differences on migration responses – both aggregate and micro data suggest that ethnicity matters, but whether or not there will be a complete (if gradual) partition is less obvious. Finally, there is virtually no sense as to whether uncertainty in economic and security considerations matters, in the former Soviet Union or elsewhere, or whether concern is restricted to levels. It is to this topic that we now turn.

III Kazakhstan-Russia migration and economic growth patterns

The period 1999-2007 was one of secular decline in the net emigration rate from Kazakhstan to Russia. During the entire period (1999-2007), net emigration to Russia was about 1.2% of Kazakhstan's population – a marked decline from over 10% during the first years of independence (1992-1998). As Becker *et al.* (2005) document, the year of peak net emigration from Kazakhstan was 1994, when roughly 2.5% of the nation emigrated, with about two-thirds of all emigrants going to Russia. There was – and continues to be – strong regional variation as well, with rates of net emigration generally highest in the predominately European northern part of the country that borders Russia. At the extreme, more than 7.5% of Northern Kazakhstan oblast's population emigrated in 1994.

From 1995-1998, the net emigration rate ranged from 1.1% to 1.7% of Kazakhstan's population, but, with the Russian default crisis of 1999 and more stable monetary and currency management in Kazakhstan, net emigration fell to 0.85% in 1999 (and to only about 0.60% heading to Russia). This level persisted for the next three years, but then a further sharp reduction in net emigration to Russia was recorded in 2003, to less than 0.2% of Kazakhstan's population. Meanwhile, substantial immigration to Kazakhstan from its southern neighbors and China occurred, much of which was unrecorded, and Kazakhstan went from being a net source of emigrants to a major destination.

These recent patterns are shown in Figure 1, which also reflects the sharp seasonality associated with emigration. Emigration is highest during the summer months and lowest during the winter. Regressions reported below correct for seasonality.

The striking differences in ethnic composition appear in Figures 2 and 3. There is an increasing share of ethnic Russians in net emigration over time, from 65% of total in 1999 to almost 90% in 2006. The net outflow of ethnic Kazakhs ceases after 2001, and the inflow becomes increasingly positive thereafter, though it is only a trivial proportion of the base Kazakh population. As a proportion of their population, Ukrainians have had the highest propensity to emigrate during 1999-2007. In general, movements of different European ethnic groups track each other closely.

Age-specific patterns are not obvious. Young adults and the elderly have the highest emigration propensities, as tends to be the case with most migration flows, but it is the *relative absence* of age and gender selectivity, at least in aggregate, that is surprising. There is virtually no age pattern at all for women, perhaps reflecting the higher proportion of women who are secondary migrants following other family members, some of whom are in different age groups.

Patterns are very region-specific. Net emigration from the boom regions (Almaty, Astana, Atyrau) has been tiny since 2003, as has net emigration from southern and western Kazakhstan. These ioannis.spyridopoulos@duke.eduioannis.spyridopoulos@duke.edupatterns appear in Table 1. That there is net emigration from the boom regions at all reflects the two stage nature of migration (documented in Becker *et al.*, 2005) in which internal migration from rural areas to cities precedes international migration. In contrast, while emigration from northern and eastern Kazakhstan – the industrial heartland – has declined, it remains high, and almost an order or magnitude higher than in the south and boom cities (whether one measures this as a percentage of all migrants, the percentage of national population, or as a percent of a region's base population).

With respect to economic differences between Kazakhstan and Russia, Seitenova and Auzhani (2009) construct a careful comparison of wages by industrial branch in Kazakhstan and Russia. At official exchange rates, the Russian average is about 20% higher, but that generally reflects sectoral composition (for example, the average wage in construction in 2006 was USD 398/month in Russia, vs. $442 in Kazakhstan) rather than systematic differences at the industry level. This modest difference in real years reflects considerable convergence, with Kazakhstan catching up to Russia relative to the 1990s.

During the period covered by this study, wages in Kazakhstan relative to Russia rise initially but then oscillate without a clear trend. Male real wages rise 160% in Kazakhstan during 1999-2007; wages for women rise even more rapidly (+172%) but continue to lag those of men. Real pensions rise 78% during this period in Kazakhstan, implying declining replacement rates – not because of falling real pensions, but rather because the extraordinary wage growth was not matched by commensurately rising pension payments. Russian inflation was higher than in Kazakhstan 1999-2002, but there has been no trend since then. Other Russia-Kazakhstan economic indicators also exhibit fluctuation but no clear trends.

To put these patterns into value terms, we note that as of the third quarter of 1999 (after the effects of the Russian crisis had rippled through both economies), Kazakhstan's average male wage (in constant 2003 prices) was 13,710 tenge, the average wage for women was 7,952 tenge, and the average pension was 3,614 tenge. These values rose to 20,387 tenge, 11,644 tenge, and 5,226 tenge, respectively, four years later in 2003:III, and to 30,357 tenge, 19,246 tenge, and 6,880 tenge, respectively, by 2007:IV. Living standards across the board clearly rose. Relative to Russian averages, male wages in Kazakhstan rose slowly during this period, from 59% in 1999:III to 63% in 2007:III. For women, relative wages fluctuated between 82% and 125% from 1992:II onward without exhibiting a clear trend. The relative Kazakhstan to Russia pension ratio rose from 52% in 1999:III to 67% in 2003:III, but had declined to 60% by 2007:III.

From our perspective, the absence of a strong time trend in major economic relative values during this period is ideal, as it allows us to examine the effect of measures of uncertainty of outcomes without being worried about secular time trends. There are, of course, strong secular time trends in each country's economic variable levels, and even in their growth rates. However, *relative* values do not show strong trends, since both Kazakhstan and Russia experienced rapid economic recovery and growth.

IV Modeling the migration decision

Following Arrow (1970), Pratt (1964), and Becker, Philipson, and Soares (*AER*, 2005), we assume individuals' preferences can be captured by an instantaneous utility function:

$$u(c) = \frac{c^{1-1/\gamma}}{1-1/\gamma} + \alpha \qquad \alpha = c^{1-1/\gamma}\left[\frac{1}{\varepsilon} - \frac{1}{1-1/\gamma}\right]$$

$$\varepsilon \equiv u'(c)\frac{c}{u(c)} = \frac{(\gamma-1)}{\gamma + (\gamma-1)\alpha c^{(\gamma-1)/\gamma}} \tag{1}$$

- α = level of annual consumption at which individual would be indifferent between being alive and dead (<0), *u*(dead) = 0.
- γ = 1.250: inter-temporal elasticity of substitution (>1).
- ε = elasticity of instantaneous utility function (0.346)
- c = annual income/consumption

This utility function exhibits declining marginal utility of consumption at any instant, positive risk aversion, and constant relative risk aversion. The Arrow-Pratt measure is:

$$\rho \equiv -\frac{u'(c)}{u''(c)\cdot c} = \frac{1}{\gamma}. \tag{2}$$

This implies a preference for consumption smoothing over time, and for less uncertain states of the world at any instant. It also implies preference for stable incomes (assuming limited options for holding assets).

As discussed in Section II, Smith (1979), Banerjee and Kanbur (1981), O'Connell (1997), and Anam, Chiang, and Hua (2008) all have developed models that explore the impact of income uncertainty at the origin, destination, or both. This result is a property of risk aversion, which in turn reflects diminishing marginal utility of income (or, equivalently, convexity of the indirect utility function in the income/wealth argument). While such convexity is not an inevitable outcome for all individuals at all income levels – there could be threshold levels at some points for some individuals – it is overwhelmingly likely in a world without lumpiness or discontinuities in consumption, and without strong complementarity effects (so that buying, say, an additional bag of peanuts leads to a huge rise in enjoyment of the ice cream cone one has just consumed) that marginal utility will decline as income and hence consumption expands. The simple reason for this is that a rational agent will purchase essential items first, ensuring adequate shelter, clothing, food, and transportation before acquiring yachts or buying artwork.

The conventional migration model is one in which individuals migrate to maximize current expected incomes. In this case labor markets clear to equate expected values. Non-economic (amenities and disamenities; preference for living with one's own ethnic group or relatives) and indirectly economic (education) motives can easily be incorporated. Objectives of secondary migrants (and especially those who are not labor force participants or pension recipients) can be easily incorporated. These and other modifications are discussed in Becker and Morrison (1999). Many modifications to the labor market equilibrium model also have been made. Todaro (1969) incorporates expectations into this framework, allowing people to consider the possibility of being unemployed – though, since the equilibrium is one of equal expected wages, the underlying assumption is that indirect utility functions are linear in income.

It is also straightforward to accommodate response lags. These imply less than perfect market clearance, with labor flows in the direction of higher wages. Incorporation of expectations of future events can be achieved by assuming that individuals seek to maximize the present discounted value of income streams in choosing location. In this case, expected future wages also matter. However, while lags and expectations can be incorporated without difficulty in a model, they have major implications for empirical specifications. If lags are important, then migration flows will depend on lagged stock values of exogenous variables as well as on rates of change of these variables. If decision units are forward-looking, then the modeler must incorporate a forecasting equation or assumptions as well.

The most difficult task is to model expectations. Following O'Connell (1997), it is reasonable to anticipate that individuals care both about intertemporal uncertainty – about fluctuations in future incomes – and about uncertainty of outcomes in the short run. The utility function specified in (1) implies that both types of uncertainty should matter, but concern over intertemporal fluctuations in income also imply imperfect capital markets in which it is difficult to save for a rainy day, or to borrow to cover unexpected downturns.

In the Kazakhstan and Russia contexts, the static/long-term distinction is blurred. By late 1999, both countries had stable financial institutions where one could save without great risk of loss – though, by Western standards, banks made it remarkably costly in terms of time and fixed fees to withdraw funds from savings accounts in the early part of our time frame. However, while risks, especially *ex post*, did not turn out to be large, the populations of both countries had been traumatized by the uncertainty of the late Soviet period and the wild oscillations along a nose-diving trend of the early post-Soviet period. As Natalia Mirovitskaya has remarked, post-Soviet citizens craved stability. Faith in institutions and hence long-term planning in the Western sense hardly existed: in economists' terms, people had very high discount rates, and likely were highly risk averse.

Given high discount rates and an unstable environment, we assume that expectations are based on current values plus an adjustment factor that incorporates information from the recent past. We assume further that updating takes place as more information becomes available. It is conventional to refer to such a model as Bayesian updating, but it is not clear that we can really distinguish between Bayesian and non-Bayesian updating behavior given our short and highly aggregated data set (Epstein, 2006). Thus, for example, anticipated future income y is expected to depend on current income, plus adjustments that depend on differences between current and past income values. In the context of rapidly changing post-Soviet societies, we also assume that the information content of past events decays rapidly according to some discount function $\delta(t)$.

$$E(y_{t+n})|_t = y_t + \sum_{\tau=t-i}^{\tau=t-8} \delta_\tau f(y_\tau - y_t) \qquad \textbf{(3)}$$

If the agent does not use information from periods prior to the current one, she is perfectly myopic. How she uses the information is something we do not restrict. The agent could conservatively (and, in the context of a period of economic growth, pessimistically) assume that earnings will follow a mean reversion process, in which case the sign on lagged Russia/Kazakhstan wages will be negative. Alternatively, and we believe more plausibly, she may anticipate that growth trends will persist, in which case the estimated sign should be positive.

The critical assumptions, then, are that individuals use past information in determining migration choices, and that they update this information set over time, discarding distant observations and restricting the information set under consideration to a finite time period. Specifically, we assume that the information set period is restricted to two years, or eight quarters. In the post-Soviet context, this seems like a long time.

Thus, the general problem is to maximize the present discounted value of instantaneous utility as expressed in (1), subject both to location choices and location-specific budget constraints (and hence incomes), as well as to moving costs. We assume that uncertainty is greatest over relative earnings y (or pensions, p, for the elderly) and exchange rate movements e. The entire information set concerning a specific economic signal – for example, relative pension payments p in Kazakhstan and Russia[2] – is

$$\Omega(P) = \{p_{t=0}, \delta_{-1} p_{-1}, \delta_{-2} p_{-2}, ..., \delta_{-T} p_{-T}, e_0, \delta_{-1} e_{-1}, \delta_{-2} e_{-2}, ..., \delta_{-T} e_{-T}\} \quad \textbf{(4)}$$

From (4), given assumed or estimated values of function $\delta(t)$, we could estimate period-specific values for the discount weight-adjusted expected value of p, as well as its standard deviation s_p and, in principle, measures of its discounted skewness and kurtosis. The empirical work that follows starts with the extremely simple assumption that all periods considered are weighted equally.[3] As noted above, none of the economic variables have secular time trends. Thus, we implicitly assume a semi-myopic forecaster whose information set about future expected values (risk) is completely limited to the discounted expected value (standard deviation) based on past observations.

This framework allows us to explore four competing paradigms given our information on migration from Kazakhstan to Russia. The first concerns the pace of adjustment – whether there are low migration and adjustment costs and hence rapid adjustment, or whether high migration costs lead to

[2] Those with full work history from the Soviet era are generally eligible for complete Solidarity system pensions in either Kazakhstan or Russia. Those with incomplete histories have partial rights, and will accumulate future rights as they work. Individuals who have amassed accumulations under Kazakhstan's accumulative pension system can cash out if they declare an intention to leave permanently. Although this has some distorting effect on individuals' decisions, it is unlikely that the impact is large.

[3] One could also forecast future values for each of the key economic variables: we did not.

sluggish adjustment and substantial lags. In particular, lagged economic variables should matter in regressions if adjustment costs are high.

The second issue centers on the nature of migration, and whether it involves a short-run orientation toward opportunities or an irrevocable decision. In the latter case, migration is permanent, and future expected values of economic conditions should be important. So should variables that will apply only later – notably, pensions. We anticipate that these long-term factors should be especially important for non-Kazakhs, since Kazakh emigrants can regain citizenship more easily than non-Kazakhs if they decide to return. Lags also should be greater for non-Kazakhs, since the migration decision is a more momentous one. In principle, these last two effects can be captured empirically via interaction terms, though we do not explore interactions in this paper.

The third issue is whether prospective migrants act on an individual perspective or a dynastic perspective. Dynastic considerations imply that individuals care about younger generations. In particular, the elderly should care about earnings conditions (though this is not a perfect test, since there may be intra-household transfers). We address this by including wage and other labor market variable terms in the migration equations for pension-aged adults.

Finally, and of paramount interest to us, is whether migrants act to maximize expected value of discounted real income, controlling for differences in amenities and personal security, or whether they exhibit risk averse behavior. If only expected value matters, then migrants should only respond to expected (first moment) differentials. If risk is important as well, then they should be concerned about perceived variance and higher moments. The solution to the maximization problem described above implies that prospective migrants will respond both to current and anticipated future differences in incomes, pensions, and exchange rates, and that they also will respond to perceived higher moments in these terms. Whether or not they do is an empirical matter, and we turn now to measuring these higher moments.

V Estimation and initial results

We model the net migration rate *m* for age group *a* and gender *g* in year *t* as depending on a vector of relative measures of economic returns to each location $\mathbf{X}_{agt}$. It also depends on expected future values of these returns, $E(\mathbf{X}_{agt+1} \mid \mathbf{X}_{agt})$, and higher moments of the distribution of likely future values, which we refer to as $\sigma(\mathbf{X}_{agt+1} \mid \mathbf{X}_{agt}) = \sigma_{agt+1}$. Then, for oblast *j*, quarter *t*, age group *a*, and gender *g*,

$$m_{a,g,j,t} = \alpha_o + \beta_1' X_{a,g,j,t} + \beta_2' E_t(X_{a,g,j,t+1}) + \beta_3' E_t(\sigma_{a,g,j,t+1}) + \gamma_j + \tau_t + \varpi_g + \zeta_a + \varepsilon_{a,g,j,t} \quad \textbf{(5)}$$

The terms γ, τ, ω, and ζ capture oblast, time period, gender, and age group fixed effects, respectively, while ε is a random error term. Note that (5) specifies that migration will depend on the expected variance and other higher moments of the distribution of outcomes, and not on the distribution of actual outcomes.

Migration rates for grouped populations are not independent of random shocks that affect a region or age group temporarily. Thus, error terms are not likely to be independent of one another even in the presence of fixed effects. This is especially true for men and women of the same age group. We address this problem by estimating separate equations for different age *a* and gender *g* groups, and then estimating them simultaneously via seemingly unrelated regression (SUR).[4]

Migration rates are bounded to be in [0,1] so that a Logit or other limited dependent variables estimation process should be used. In practice, this is a higher order problem: in the case of pooled time series and regional data, correlation of error terms for different {age, sex} groups across time and within a region is likely to be vastly more important. Simply adding fixed or random effects will not eliminate this problem, since the error terms from different equations (for different groups) will be correlated. SUR will handle this matter, but will not handle non-stationarity, which is clearly a problem with the data.

[4] Note also that equation (5) as stated does not incorporate interaction terms. We exclude interactions initially in the absence of a model that clearly predicts the importance of some interactions. Were we to include a full set, we would suffer a severe loss in degrees of freedom.

Thus, to ensure stationarity and to reduce problems of unobserved individual effects, we move to a first differences model. At the individual level, migration is predicted to occur if the utility from a move, after accounting for moving costs *c*, exceeds utility from staying:

$$m = \begin{Bmatrix} 1 \; if \; \int u(c_{Russia,t})e^{-\rho t}dt > \int u(c_{Kazakhstan,t})e^{-\rho t}dt \\ 0 \qquad\qquad otherwise \end{Bmatrix} \qquad \textbf{(6)}$$

When one incorporates budget constraints and moving costs, and aggregates over a population, an equation such as (5) emerges. The **X** and **σ** terms include values for both Russia and Kazakhstan. We assume symmetric effects and therefore express the **X** and **σ** terms as the ratio of Russia to Kazakhstan values. Differentiating both sides of (5) then yields the expression with the form, where primes denote first derivatives:

$$m'_{a,g,j,t} = \alpha_o + \beta_1 X'_{a,g,j,t} + \beta_2 E_t(X'_{a,g,j,t+1}) + \beta_3 E_t(\sigma'_{a,g,j,t+1}) + \varepsilon_{a,g,j,t} \qquad \textbf{(5a)}$$

Thus, the dependent variable is first difference of a population's net migration rate from Kazakhstan to Russia – which is no longer bounded in [0,1]. Regressors are expressed as first differences of variables expressed as Russia/Kazakhstan ratios (for example, the change in the mean Russian wage divided by the change in the wage in a particular Kazakhstani oblast). The exchange rate variable is expressed as the change in Kazakhstani (KZ) tenge per Russian (RF) ruble. Although first differencing eliminates the fixed effects described in (5), we continue to include these age, gender, time, and region fixed effects in the regressions. They now should be interpreted as common changes – for example, the change in migration rates among residents of Karaganda oblast in all years, while controlling for changes in the economic environment.

Table 2 summarizes the system of regression. There are two sets of regressions, one allowing four-period and one with eight-period lags in the dependent variable. Each set contains eight regressions (four age groups times two genders).

We explore three higher moment variables. The first is the variance of, respectively, changes in relative incomes, changes in relative pensions, and changes in exchange rates.

$$Var_{jt} = \frac{1}{n}\sum_{i=t-8}^{t-1}(x_{ji} - \bar{x}_{jt})^2 \text{ where } \bar{x}_{jt} = \frac{1}{n}\sum_{i=t-8}^{t-1} x_{ji} \text{ and } n = 8 \text{ and } j = \text{region} \qquad \textbf{(7)}$$

We assume that information for the preceding eight quarters is equally meaningful, but that all information older than two years is dropped from consideration. That is, prospective migrants are able to calculate $\mathbf{x_{jt}}$, the first difference $\mathbf{x_{j,t}} = \mathbf{X_{j,t}} - \mathbf{X_{j,t-1}}$ between the ratio of the average gender-specific wage in Russia and the average gender-specific wage in his or her oblast of origin in Kazakhstan. The core riskiness variable then is the estimate of the variance of $\mathbf{x_{j,t}}$ from the current and preceding seven periods, and a similar measure of exchange rate variance $Var(\mathbf{e_{j,t}})$.

Variance or standard deviation is a traditional uncertainty measure, and is all that is needed if people believe that events are distributed normally. However, it is quite possible that events are not distributed normally in the transition environment. More importantly, since we use a very short series to calculate expected moments, it is plausible that people may well believe that the environment is still full of potentially dramatic shocks, leading to a malignant world of fat tails. If indirect utility functions are convex in income, then higher moments will be particularly traumatic. We explore the possible impact on changes in migration behavior of two higher moment terms.

The first of these is skewness.

$$Skew_{jt} = \left(\frac{1}{n} \sum_{i=t-8}^{t-1} (x_{ji} - \bar{x}_{jt})^3 \right) / Var_{jt}^{\;3/2} \qquad \textbf{(8)}$$

Negative values for skewness indicate data that are skewed left; positive values for the skewness indicate data that are skewed right. If more data are skewed to the right, there are many low (in absolute value) negative terms and a few high positive values in the first differences of the independent variable being considered. An estimated positive coefficient on the skewness term means that right skewness increases migration first differences and left skewness decreases them. If the term is positive, people will respond positively (increase migration) in response to a world of negative deviations that are infrequent but extremely large in absolute value.

If the skewness coefficient is negative, people will respond negatively (decrease migration) in response to relatively infrequent but very large negative shocks rather than to frequent low deviations from the mean. If the marginal utility of wealth is decreasing, then negative skewness should deter migration: the occasional highly negative event will be extremely costly, and will not be offset by the more clustered but smaller positive events. People should prefer right (+) to left (-) skewed distributions, so positive values of skewness should increase migration: the skewness term therefore should be positive.

We also include a measure of kurtosis:

$$Kurt_{jt} = \left(\frac{1}{n} \sum_{i=t-8}^{t-1} (x_{ji} - \bar{x}_{jt})^4 \right) / Var_{jt}^{\ 2} \qquad \textbf{(9)}$$

Higher kurtosis means more of the variance is due to infrequent extreme deviations, as opposed to frequent modestly-sized deviations. If fluctuations in the regressor's first difference are extreme and infrequent (*i.e.*, higher kurtosis; fat tails), an estimated negative coefficient means the first difference in the migration rate is lower. In that case, people are deterred by very large shocks rather than small ones, for any given mean and variance. We also should emphasize that, given the very small number of time periods used to calculate higher moments, the measures we term variance, skewness and kurtosis are best thought of as very rough approximations to values that would emerge from larger numbers of more frequent observations.

We emphasize here that these measures capture higher moments of the relative Russia to Kazakhstan (oblast-specific) environment. It is plausible that migration will be affected by differences in uncertainty between the two countries' environments. This is an issue we hope to explore in the future, but for now, our data set does not permit it as the "action" in these terms across groups is driven by differences in uncertainty in Kazakhstan rather than Russia.

The regression results are strongly consistent with conventional migration theory. Migration occurs in response to wage differentials (Table 3), increasing with the first difference in the ratio of the average Russian to oblast-specific Kazakhstani wage for each gender. The one-period lag is significant for those most sensitive to differential opportunities: men aged 18-44 and women aged 18-29. However, the effect of wage differentials is also strong for those of pension age, presumably because they are reasonably mobile and many will choose to migrate to stay with those in the extended family who are best off.

The peak lag effect on wages occurs after 3 quarters; the effect is significant and positive for all groups tested. In 4-period lag models, total effect for men is about twice that of women. The differential is reduced in the 8-period lag regressions. Tentatively, one might conclude that men respond more rapidly to labor market conditions than do women. This seems reasonable, as women are likely to have greater family and other non-economic responsibilities and commitments. The decline in male coefficients in the 8-period lag model can be interpreted as partial return to initial equilibrium after a shock.

Our migration regressions also include several other measures of the change in relative economic performance of Kazakhstan and Russia. Tables are presented in Appendix 1. To summarize the findings briefly, it appears that relative employment growth differentials have a smaller total effect (possibly reflecting smaller variance) and longer lags, and, while inconsistently significant, they do have expected signs (after a negative first quarter lag). Relative differences in construction activity are also small relative to wages, but are consistently significant and with expected signs. Differences in investment activity have oscillating signs but the sum is positive, as expected. The impacts start early but effects do not play out for a long time in some cases. Industrial production matters, but generally with a lag in excess of one year, and generally with an unexpected negative sign in the 4-period lag regressions. The coefficients are largest for those of or near retirement age: women aged 45+ and men aged 60+. Collinearity with wages and other economic variables may be important, though different lag structures reduce this effect. Inflation differentials have a significant and rapid effect for most age groups, but with inconsistent signs.

There is substantial but strongly lagged sensitivity to exchange rate volatility, especially among the middle-aged and elderly. These coefficients appear in Table 4. With the anomalous exception of males aged 30-59, the signs are as expected.

Differences in pensions matter surprisingly little, though they do have the predicted sign and are significant for the male age 60+ population in both 4- and 8-period lag models. For women, coefficients are either insignificant or of an unexpected sign. Finally, there is strong autocorrelation in the migration process. The sum of lags is negative, implying partial correction and reversion back to the initial equilibrium – or simply a flow back of disillusioned migrants.

Summing up, the responsiveness of young (18-29 and 30-44 year old) adults to economic differentials is not surprising. We did not anticipate the substantial response of older migrants to these economic factors (and pensions, which is not surprising). The most likely interpretation is that the elderly are joining children, who encourage them to migrate when they have the financial resources to assist.

VI Chasing expected returns vs. ethnic partition

The consistency of the Kazakhstan-Russia migration regressions with standard pull/push variables is heartening, but another affirmation of conventional theory is not our primary interest. Rather, we seek to learn more about the importance of physical security and economic uncertainty. Table 5 sheds some light on the first of these issues. With respect to demographic controls, oblasts with high Russian/other European ethnic shares are expected to have higher emigration rates to Russia if there is a partitioning effect at work that reflects a push by each ethnic group to return to the physical security of a more homogeneous community.

This does not show up in the regressions. We tried several alternative specifications, and in no case were ethnic variables important. Table 5 shows the results when the measure used is the migration rate to Russia of Russian and German ethnic groups, respectively. It is possible in principle that Russian and German ethnic groups have universally but invariant high emigration rates, and that lack of variance causes the insignificance, but from other, unreported regressions, we know this is not the case. Base proportion of non-Kazakh ethnicities is also insignificant. Indeed, it is worth noting that the Russian and German populations are concentrated in northern Kazakhstan, which is closer to Russia than other areas. Since we did not include a mean distance variable, but one would expect closer regions to be more sensitive to changes in relative conditions than more distant regions, then the effect of omitted variables bias on the ethnicity terms is *positive*.

The lack of significance of the ethnic terms suggests two possibilities. The simplest is that partition effects really do not matter. While it is true that non-Kazakhs have much higher emigration rates, it would appear that the differences across nationalities can be accounted for by differences in demographic and occupational factors, and economic conditions of their home regions. The second explanation begins by noting that the dependent variable is the *change* in the net migration rate of various groups rather than the *level*. Quite conceivable, ethnicity effects affect only levels rather than reactions to changes. As we cannot distinguish between these explanations, we are left with the weak conclusion that there is no evidence to suggest that ethnic composition is important in affecting the growth or decline of emigration rates.

Table 5 also presents the effects of other demographic variables. These variables capture two effects. First, the oblast marriage and birth rate terms are measures of events that make migration costly by increasing interdependencies and the complexity of family relationships. One would expect these events to deter migration and that is indeed the case, but they are never significant.

Second, these terms also reflect the community's perception of the future, and the degree of social cohesion at present. Marriages and births occur in societies that are optimistic about the future, and hence less inclined to emigrate. This effect reinforces the cost effect, making the insignificance more striking still – though it remains possible that the impacts are all in levels rather than in first differences. On the other hand, communities that are suffering severe social stress tend to have higher divorce and death rates, and one would expect emigration gradients from such places to be steeper. This turns out to be the case. The divorce rate consistently has the expected positive sign, and is significant in five of 16 regressions. Divorce rates in Kazakhstan are not high, but doubtless are positively correlated with spousal separation and abandonment, which is common. In effect, then, the divorce rate serves as a bellwether of social decline.

Mortality is even more telling. The effect on the migration gradient is positive in all cases and significant in 13 of them. Even though the measure we ultimately use in Table 5 (while noting that the results are not sensitive to alternatives) is the crude death rate for the population over 60, its impact is actually greater on migration of younger age groups.

These demographic terms are best thought of as controls, since they will be highly collinear, making it difficult to attach great confidence to any particular coefficient value. There is also a strong relationship between these variables and ethnic composition (Becker and Hemley, 1998; Becker and Urzhumova, 2005), leading to a third possible reason for the lack of significance of the ethnic composition terms.

VII Does economic risk climate matter?

As discussed, economic theory suggests that, in addition to means, higher moments in the distribution of key economic pull/push variables also should influence migration decisions. We test this only imperfectly, given the limited time series available and the fact that we only have grouped data. We begin by exploring wage variance, skewness, and kurtosis, where these statistics refer to the first difference of Russian/Kazakhstani ratios. Results from regressions including only higher moments of relative wage terms are shown in Table 6. Table 7 then presents results from regressions including both wage and exchange rate higher moments. The results are not sensitive to specifications that only include variance, or that include higher moments of other economic variables (notably, employment growth – though its higher moments do not turn out to be statistically significant).

The results are striking. The change in migration almost universally diminishes, generally significantly (in 10 of 16 cases in both Tables 6 and 7), as variance rises. Moreover, this effect is always greater for men than women, generally by almost an order of magnitude. The negative effect of variance is also much larger for the young and elderly than for prime working age adults. That is, those with the highest migration rate are also most sensitive to measures of general labor market uncertainty.

Wage skewness is mostly but not consistently negative, contrary to our expectations. However, it has a large and significant effect only for women aged 18-44. When exchange rate moments are included, the skewness variable is significant only for elderly women in the 8-period lag specification (and then with the expected, positive sign).

Wage kurtosis – the fat tail effect – is universally negative, as theory predicts, and is significant in 7 of 16 cases in Table 6 and in 11 cases in Table 7. This finding is consistent with Becker *et al.* (2005), who find in the 1990s that large shocks had an additional impact – in effect, there was a threshold for some information.

While not always the case, the coefficients on kurtosis tend to be larger in absolute value and more statistically significant for women than men. A casual interpretation would be that women pay more attention to extreme events than men who, however, also dislike uncertainty (as evidenced by the variance coefficients).

Adding exchange rate risk measures have trivial impacts on wage uncertainty terms. Exchange rate variance itself has no consistent effect on migration: it is (marginally) significant in only four of 16 cases, and of those, two had positive and two had negative signs. Exchange rate kurtosis is consistently negative, but is significant in only five of the 16 cases. However, higher moment effects do show up for exchange rates in the case of skewness, which has a consistently positive and generally (11 of 16 cases) significant effect.

It is difficult not to conclude that migration is influenced by more than simply mean differences. This should be no surprise from theory, which predicts that risk-averse individuals will avoid taking highly uncertain gambles. While our uncertainty measures do not distinguish between uncertainty at the origin and the destination (since we use higher moments of the changes in ratios), it is reasonable to expect that individuals have relatively good information about their own, specific situation, so that most of the uncertainty would be perceived as relating to the relative gain from migration.

However, there is an alternative, complementary explanation for the significance of the higher moment terms that does not rely on risk aversion. It is quite possible that, differences in means are all that really matter, and that large higher moments are simply interpreted as noisiness of the mean. In this case, uncertainty matters, but it reflects concern over uncertainty in the signal rather than uncertainty in the outcome.

VIII Summing up: returns, risk, and homogeneity

Having established that higher moments matter – though for possibly multiple, complementary reasons – it is important to ask about the magnitude of the effects relative to the means. One way to get at this is to multiply coefficients by standard deviations; doing so leads us to conclude that the main action is still in differences in means. For example, a one standard deviation increase in relative wage variance (using Table 6 coefficients) will result in a 0.011% reduction in the change in age 18-

29 male migration from Kazakhstan to Russia (relative to a standard deviation of 0.0732% for this group's migration during the period). In comparison, a one standard deviation increase in relative wage mean (using Table 3 coefficients) will result in a 0.066% increase in the change in age 18-29 male migration. Of course, this latter effect is not immediate, but rather reflects the sum of the entire four quarters for which the lagged effects matter. The limited time series makes it impractical for us to explore lagged higher moment effects; if these effects matter, then the comparison is biased in favor of the average wage terms.

For men aged 30-44, the variance effect (multiplied by a standard deviation) is -0.005%, while the wage effect is +0.054%, an order of magnitude difference. A similar order or magnitude difference is recorded when we compare the kurtosis effect for women (for example, +0.0071 when multiplied by a one standard deviation change for women aged 45-59, again using Table 6 coefficients, from regression 7b, relative to a wage effect of +0.074%). Whether the order of magnitude difference for wage means relative to higher moments will remain once better measures of uncertainty and longer time series are used remains to be seen.

What we can argue with considerable confidence it that uncertainty, and especially wage uncertainty, is important. People do not like uncertainty, and do not like fat tails in their perceived distribution of possible outcomes, either because is indicates that their future earnings are highly uncertain, or that the quality of information signals is low, or both. There is a great deal of work to do, using micro data and longer time series, to strengthen confidence in these conclusions. Yet, the robustness of the results obtained here and their near imperviousness to alternative specifications leads us to believe that the migration literature has deemphasized an important factor in human movements. It has done so for reasons of data paucity and complexity in designing tests rather than a lack of theoretical justification – indeed, theory unambiguously points to the importance of higher moments. This paper, using a fortuitously detailed data set on migration from Kazakhstan to Russia, provides a first piece of support for the theory of optimizing agent location choice under uncertainty.

References

Agadjanian, Victor, Lesia Nedoluzhko, and Gennady Kumskov, 2005, "Marriage, fertility, and migration in Kyrgyzstan" (*Брачность, рождаемость и миграция в Кыргызстане*), Biskhek, Kyrgyzstan: United Nations report.

Agadjanian, Victor, Lesia Nedoluzhko, and Gennady Kumskov, 2008, "Eager to leave? Intentions to migrate abroad among young people in Kyrgyzstan," *International Migration Review* **42**(3): 620-651.

Agesa, Richard U. and Sunwoong Kim, 2001, "Rural to urban migration as a household decision: evidence from Kenya," *Review of Development Economics* **5**(1): 60-75.

Anam, Mahmudul, Shin-Hwang Chiang, and Lieng Hua, 2008, "Uncertainty and international migration: an option cum portfolio model," *Journal of Labor Research* **29**(3): 236-250.

Andrienko, Yury and Sergei Guriev, 2004, "Determinants of interregional mobility in Russia," *Economics of Transition* **12**(1): 1-27.

Banerjee, Biswajit and S.M. Kanbur, 1981, "On the specification and estimation of macro rural-urban migration functions: with an application to Indian data," *Oxford Bulletin of Economics & Statistics* **43**(1): 7-29.

Becker, Charles M. and Andrew R. Morrison, 1999, "Urbanization in transforming economies," in Paul Cheshire and Edwin S. Mills, Eds. *Handbook of Regional and Urban Economics, Vol. 3: Applied Urban Economics*. Amsterdam: North-Holland, pp. 1673-1790.

Becker, Charles M. and David D. Hemley, 1998, "Demographic change in the former Soviet Union during the transition period." *World Development*, **26**(11), November 1998, pp. 1957-1976.

Becker, Charles M., Erbolat Musabek, Ai-Gul Seitenova, and Dina Urzhumova, 2003, "Short-run migration responses of men and women during a period of economic turmoil: lessons from Kazakhstan." *Eurasian Geography and Economics* **44**(3): 228-243.

Becker, Charles M., Erbolat Musabek, Ai-Gul Seitenova, and Dina Urzhumova, 2005, "The migration response to economic shock: lessons from Kazakhstan." *Journal of Comparative Economics* **33**(1): 107-132.

Becker, Charles M. and Dina Urzhumova, 2005, "Mortality recovery and stabilization in Kazakhstan," *Economics and Human Biology*, **3**(1): 97-122.

Becker, Gary, Tomas Philipson, and Rodrigo Soares, 2005, "The quantity and quality of life and the evolution of world inequality," *American Economic Review* **95**(1): 277-291.

Bharadwaj, Prashant, Asim Ijaz Khwaja, and Atif Mian, 2008a (June), "The big march: migratory flows after the partition of India," Cambridge, MA: Harvard University, John F. Kennedy School of Government *working paper RWP08-029*.

Bharadwaj, Prashant, Asim Ijaz Khwaja, and Atif Mian, 2008b (October), "The partition of India: demographic consequences," Cambridge, MA: Harvard University, John F. Kennedy School of Government unpublished paper, http://ksghome.harvard.edu/~akhwaja/papers/BigMarchOct2008.pdf.

Blomqvist, Åke. G. 1978. Urban job creation and unemployment in LDCs: Todaro *vs.* Harris and Todaro." *Journal of Development Economics* **5**(1): 3-18.

Brubaker, Rogers, 1998, "Migrations of ethnic unmixing in the 'New Europe'," *International Migration Review* **32**(4): 1047-1065.

Brueckner, Jan K. and Hyun-A Kim, 2001, "Land markets in the Harris-Todaro model: a new factor equilibrating rural-urban migration," *Journal of Regional Science* **41**(3): 507-520.

Chen, Kong-Pin, Shin-Hwan Chiang, and Siu Fai Leung, 2003, "Migration, family, and risk diversification," *Journal of Labor Economics* **21**(2): 353-380.

Epstein, Larry G., 2006, "An axiomatic model of non-Bayesian updating," *Review of Economic Studies* **73**: 413-36

Fidrmuc, Jan, 2004. Migration and regional adjustment to asymmetric shocks in transition economies. *Journal of Comparative Economics* **32**: 230-247.

Grun, Rebekka E., 2009, "Exit and save: migration and saving under violence," Washington, DC" World Bank *policy research working paper no. 4918*.

Harris, John R. and Michael P. Todaro, 1970, "Migration, unemployment and development: a two-sector analysis." *American Economic Review* **60**(1): 126-142.

Heitmueller, Axel, 2005, "Unemployment benefits, risk aversion, and migration incentives," *Journal of Population Economics* **18**: 93-112.

Heleniak, Timothy. 1999. "Migration from the Russian north during the transition period." Washington, DC: World Bank, *Social Protection Discussion Paper No. 9925*.

Kanbur, Ravi and Hillel Rapoport, 2005, "Migration selectivity and the evolution of spatial inequality," *Journal of Economic Geography* **5**(1): 43-57.

Katz, Eliakim and Oded Stark, 1986, "Labor migration and risk aversion in less developed countries," *Journal of Labor Economics* **4**(1): 134-149.

Knight, John and Richard Sabot, 1990, *Education, Productivity and Inequality: The East African Natural Experiment,* New York: Oxford University Press.

Lewis, W. Arthur, 1954, "Economic development with unlimited supplies of labour." *The Manchester School* **22**(2): 139-191.

Mora, Jorge and J. Edward Taylor, 2006, "Determinants of migration, destination, and sector choice: disentangling individual, household, and community effects," in Çağlar Özden and Maurice Schiff, Eds., *International Migration, Remittances & the Brain Drain*. Houndmills, Basingstoke, Hampshire, UK: Palgrave Macmillan.

O'Connell, Paul, 1997, "Migration under uncertainty: 'Try your luck' or 'wait and see'," *Journal of Regional Science* **37**(2): 331-347.

Quartey, Peter and Theresa Blankson, 2004, "Do migrant remittances minimize the impact of macro-volatility on the poor in Ghana?" Legon, Ghana. Final report submitted to the Global Development Network.

Rosenzweig, Mark R. and Oded Stark. 1989. "Consumption Smoothing, Migration and Marriage: Evidence from Rural India." *Journal of Political Economy* **97**.

Rowland, Richard H. 2001. "Regional population change in Kazakhstan during the 1990s and the impact of nationality population patterns." *Post-Soviet Geography and Economics* **42**(8), pp. 571-614.

Seitenova, Ai-Gul and Erkanat Auzhani, 2009 (June 10), "Comparison of statistical methods of collecting information for studying wage inequality in Kazakhstan and Russia," Almaty: RAKURS Center for Economic Analysis, *Statistical Notes no. 2.2* http://www.cear.kz/index.cfm?uid=CB6363B8-C29A-EB54-236BB0FFD3FB8771&docid=1&CFID=4139841&CFTOKEN=73572256

Smith, Terence, 1979, "Migration, risk aversion, and regional differentiation," *Journal of Regional Science* **19**(1): 31-45.

Stark, Oded, 1991, *The Migration of Labor*. Cambridge, MA and Oxford, UK: Basil Blackwell.

Stiglitz, Joseph E., 1969, "Rural-urban migration, surplus labour, and the relationship between urban and rural wages," *Eastern Africa Economic Review* **1**(1): 1-27.

Stiglitz, Joseph E., 1974, "Alternative theories of wage determination and unemployment in LDCs: the labor turnover model," *Quarterly Journal of Economics* **88**(2): 194-227.

Stiglitz, Joseph E., 1976, "The efficiency wage hypothesis, surplus labor, and the distribution of income in LDCs," *Oxford Economic Papers* **28**(7): 185-207.

Taylor, J. Edward, 1987, "Undocumented Mexico-US migration and returns to households in rural Mexico," *American Journal of Agricultural Economics*, **69**(3): 626-638.

Taylor, J. Edward, Scott Rozelle, and Alan de Brauw, 2003, "Migration and incomes in source communities: a new economics of migration perspective from China," *Economic Development & Cultural Change* **52**(1): 75-101.

Tishkov, Valery, Zhanna Zayonchkovskaya, and Galina Vitkovskaya, 2005, "Migration in the countries of the former Soviet Union," Geneva: Global Commission on International Migration, unpublished ms.

Todaro, Michael P., 1969, "A model of labor, migration, and urban unemployment in less developed countries." *American Economic Review* **59**(1): 138-148.

Tsegai, Daniel, 2007, "Migration as a household decision: What are the roles of income differences? Insights from the Volta basin of Ghana," *European Journal of Development Research* **19**(2): 305-326.

Vargas-Silva, Carlos and Peng Huang, 2006, "Macroeconomic determinants of workers' remittances: host versus home country's economic conditions," *Journal of International Trade & Economic Development* **15**(1): 81-99.

Wang, Tan and Tony S. Wirjanto, 2004, "The role of risk and risk aversion in an individual's migration decision," *Stochastic Models* **20**(2): 129-147.

Zaionchkovskaya, Zhanna A. 1996. "Migration patterns in the former Soviet Union," in Jeremy R. Azrael and Emil A. Payin, Eds. *Cooperation and Conflict in the Former Soviet Union: Implications for Migration*. Santa Monica, CA: RAND.

Figure 1
Net Emigration from Kazakhstan to Russia, by Gender, 1999:I – 2007:IV

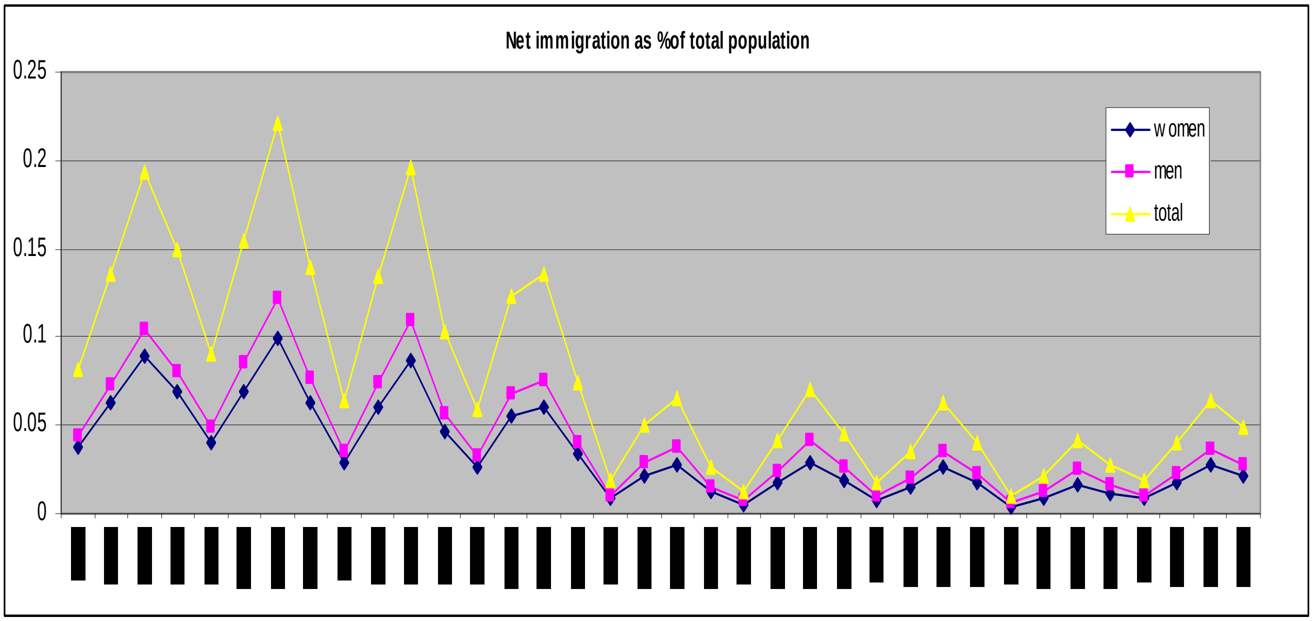

Figure 2
Net Emigration as a Percentage of Total Migrants, by Nationality, 1999-2007

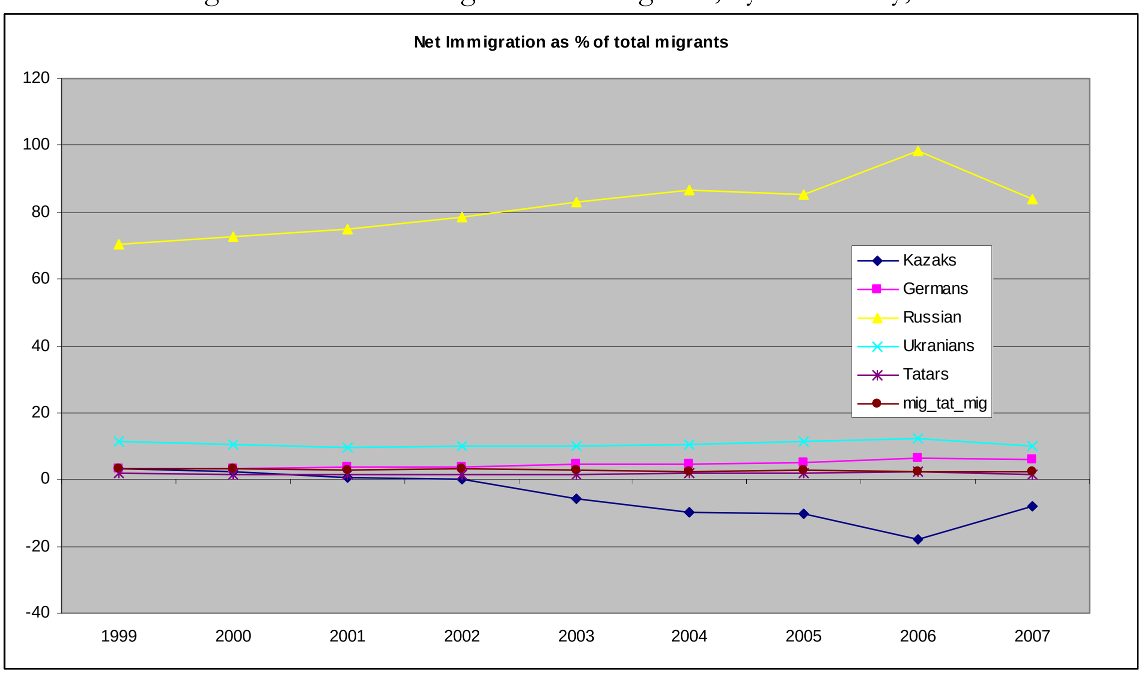

Figure 3
Net Emigration as a Percentage of Population, by Nationality, 1999-2007

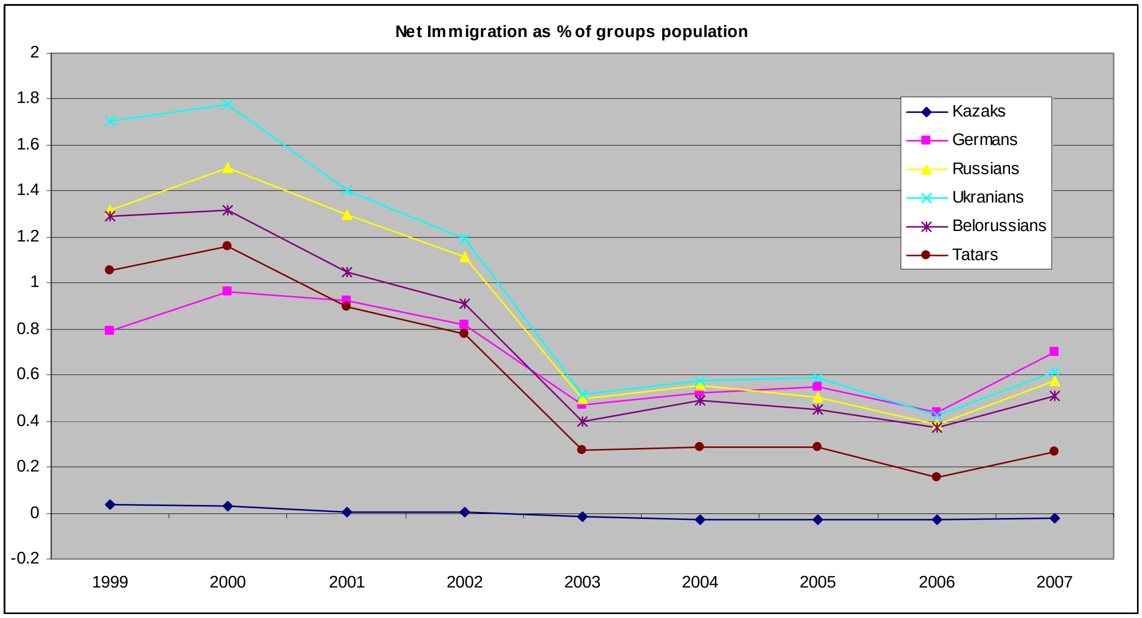

Table 1

Net migration from Kazakhstan to Russia, % of total Kazakhstani population, by year and oblast

Oblast	1999	2000	2001	2002	2003	2004	2005	2006	2007
Astana city	0.0211	0.0341	0.0203	0.0130	0.0035	0.0036	0.0030	0.0019	0.0050
Almaty city	0.0234	0.0440	0.0473	0.0233	0.0119	0.0109	0.0092	0.0093	0.0118
Atyrauskaya	0.0024	0.0018	0.0011	0.0010	0.0010	0.0003	-0.0007	-0.0002	0.0013
Unweighted average of boom regions	*0.0156*	*0.0266*	*0.0229*	*0.0124*	*0.0055*	*0.0049*	*0.0038*	*0.0037*	*0.0060*
Akmolinskaya	0.0657	0.0402	0.0364	0.0338	0.0159	0.0097	0.0129	0.0089	0.0186
Kostanai	0.1077	0.0830	0.0656	0.0485	0.0127	0.0166	0.0200	0.0130	0.0251
North Kazakhstan	0.0204	0.0158	0.0203	0.0221	0.0128	0.0245	0.0188	0.0118	0.0241
Pavlodar	0.0631	0.0692	0.0524	0.0441	0.0157	0.0105	0.0077	0.0027	0.0067
West Kazakhstan	0.0500	0.0479	0.0121	0.0046	0.0015	0.0060	0.0072	0.0052	0.0083
Unweighted average of north-central Kazakhstan	*0.0614*	*0.0512*	*0.0374*	*0.0306*	*0.0117*	*0.0135*	*0.0133*	*0.0083*	*0.0166*
Aktyubinsk	0.0387	0.0520	0.0265	0.0176	0.0087	0.0094	0.0077	0.0020	0.0031
Kzyl-Orda	0.0078	0.0118	0.0082	0.0066	0.0027	0.0022	0.0020	0.0017	0.0026
Mangistau	0.0157	0.0085	0.0044	0.0036	0.0016	0.0015	0.0022	0.0009	0.0022
South Kazakhstan	0.0198	0.0193	0.0222	0.0192	0.0089	0.0064	0.0062	0.0026	0.0036
Zhambyl	0.0152	0.0305	0.0383	0.0294	0.0106	0.0092	0.0057	0.0067	0.0067
Unweighted average of south and west Kazakhstan	*0.0194*	*0.0244*	*0.0199*	*0.0153*	*0.0065*	*0.0057*	*0.0048*	*0.0028*	*0.0036*
Almatinskaya	0.0181	0.0344	0.0347	0.0264	0.0120	0.0077	0.0053	0.0054	0.0092
East Kazakhstan	0.0369	0.0477	0.0475	0.0564	0.0241	0.0396	0.0335	0.0203	0.0295
Karaganda	0.0540	0.0633	0.0569	0.0411	0.0183	0.0135	0.0174	0.0114	0.0213
Unweighted average of east & southeast Kazakhstan	*0.0363*	*0.0485*	*0.0464*	*0.0413*	*0.0181*	*0.0203*	*0.0187*	*0.0124*	*0.0200*

Table 2
SUR migration equations -- overview

number	Dependent variable	No. of obs	*Adjusted-* R^2	*F*	Demog controls	No. of lags	Oblast fixed effects	Period fixed effects	Time trend
1a	Male 18-29 net migration as % of base (1999) population	432	0.7194	10.21	Yes	4	Yes	Yes	Yes
1b	Female 18-29 net migration as % of base (1999) population	432	0.6690	8.26	Yes	4	Yes	Yes	Yes
2a	Male 30-44 net migration as % of base (1999) population	432	0.6150	6.74	Yes	4	Yes	Yes	Yes
2b	Female 30-44 net migration as % of base (1999) population	432	0.6836	8.76	Yes	4	Yes	Yes	Yes
3a	Male 45-59 net migration as % of base (1999) population	432	0.6773	8.29	Yes	4	Yes	Yes	Yes
3b	Female 45-59 net migration as % of base (1999) population	432	0.6856	8.58	Yes	4	Yes	Yes	Yes
4a	Male 60+ net migration as % of base (1999) population	432	0.6966	8.98	Yes	4	Yes		
4b	Female 60+ net migration as % of base (1999) population	432	0.6709	8.08	Yes	4	Yes	Yes	Yes
5a	Male 18-29 net migration as % of base (1999) population	432	0.7548	12.05	Yes	8	Yes	Yes	Yes
5b	Female 18-29 net migration as % of base (1999) population	432	0.6837	8.96	Yes	8	Yes	Yes	Yes
6a	Male 30-44 net migration as % of base (1999) population	432	0.6491	7.43	Yes	8	Yes	Yes	Yes
6b	Female 30-44 net migration as % of base (1999) population	432	0.7193	10.05	Yes	8	Yes	Yes	Yes
7a	Male 45-59 net migration as % of base (1999) population	432	0.6969	8.62	Yes	8	Yes	Yes	Yes
7b	Female 45-59 net migration as % of base (1999) population	432	0.7176	9.36	Yes	8	Yes	Yes	Yes
8a	Male 60+ net migration as % of base (1999) population	432	0.7289	9.91	Yes	8	Yes	Yes	Yes
8b	Female 60+ net migration as % of base (1999) population	432	0.6975	8.42	Yes	8	Yes	Yes	Yes

Table 3
Relative wages and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	0.1198*** (0.0420)	0.2946*** (0.0491)	3	4	0.9124
1b	Female 18-29 net migration as % of 18-29 female population	0.0506 (0.0326)	0.1885*** (0.0381)	3	4	0.4741
2a	Male 30-44 net migration as % of 30-44 male population	0.0858*** (0.0310)	0.2676*** (0.0370)	3	4	0.7493
2b	Female 30-44 net migration as % of 30-44 female population	0.0234 (0.0183)	0.1147*** (0.0219)	3	4	0.2721
3a	Male 45-59 net migration as % of 45-59 male population	0.0735* (0.0428)	0.3467*** (0.0472)	3	4	0.8512
3b	Female 45-59 net migration as % of 18-29 male population	0.0458 (0.0313)	0.2585*** (0.0490)	3	4	0.5934
4a	Male 60+ net migration as % of 60+ male population	0.1322** (0.0564)	0.3720*** (0.0663)	3	4	0.9426
4b	Female 60+ net migration as % of 60+ female population	0.1037*** (0.0422)	0.3345*** (0.0699)	3	4	0.8586
5a	Male 18-29 net migration as % of 18-29 male population	0.1468**** (0.0373)	0.3196*** (0.0468)	3	4	0.9837
5b	Female 18-29 net migration as % of 18-29 female population	0.0684** (0.0298)	0.1810*** (0.0334)	3	4	0.5535
6a	Male 30-44 net migration as % of 30-44 male population	0.0787*** (0.0304)	0.2548*** (0.0350)	3	4	0.7156
6b	Female 30-44 net migration as % of 30-44 female population	0.0272 (0.0189)	0.1506*** (0.0238)	3	5	0.4032
7a	Male 45-59 net migration as % of 45-59 male population	0.0917** (0.0458)	0.3387*** (0.0496)	3	4	0.8773
7b	Female 45-59 net migration as % of 18-29 male population	0.0540* (0.0293)	0.2549*** (0.0454)	3	4	0.6454
8a	Male 60+ net migration as % of 60+ male population	0.1339*** (0.0540)	0.3382*** (0.0669)	3	7	1.0099
8b	Female 60+ net migration as % of 60+ female population	0.1211*** (0.0422)	0.3200*** (0.0605)	3	4	0.8624

*** significant at .01 level; ** significant at .05 level; * significant at .10 level

Table 4
Tenge/ruble exchange rate movement and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	-0.0020 (0.0202)	-	-	-	-
1b	Female 18-29 net migration as % of 18-29 female population	0.0043 (0.0285)	-	-	-	-
2a	Male 30-44 net migration as % of 30-44 male population	-0.0323* (0.0170)	-0.0323* (0.0170)	1	1	-0.0323
2b	Female 30-44 net migration as % of 30-44 female population	-0.0267 (0.0181)	-	-	-	-
3a	Male 45-59 net migration as % of 45-59 male population	-0.0506** (0.0224)	-0.0599*** (0.0238)	3	3	-0.1104
3b	Female 45-59 net migration as % of 18-29 male population	-0.0518 (0.0331)	0.0878*** (0.0325)	4	4	0.0878
4a	Male 60+ net migration as % of 60+ male population	-0.0857** (0.0360)	0.1139*** (0.0332)	4	4	0.0282
4b	Female 60+ net migration as % of 60+ female population	-0.1124** (0.0484)	0.1563*** (0.0430)	4	4	0.0439
5a	Male 18-29 net migration as % of 18-29 male population	-0.0143 (0.0190)	-	-	-	-
5b	Female 18-29 net migration as % of 18-29 female population	0.0055 (0.0294)	-	-	-	-
6a	Male 30-44 net migration as % of 30-44 male population	-0.0237 (0.0164)	-	-	-	-
6b	Female 30-44 net migration as % of 30-44 female population	-0.0139 (0.0191)	0.0352* (0.0186)	4	4	0.0352
7a	Male 45-59 net migration as % of 45-59 male population	-0.0287 (0.0202)	0.0643*** (0.0240)	4	4	0.0301
7b	Female 45-59 net migration as % of 18-29 male population	0.0314 (0.0365)	0.1508*** (0.0359)	4	4	0.1508
8a	Male 60+ net migration as % of 60+ male population	-0.0398 (0.0313)	0.1424*** (0.0315)	4	4	0.1424
8b	Female 60+ net migration as % of 60+ female population	0.0059 (0.0478)	0.2225*** (0.0472)	4	4	0.2225

Table 5

Kazakhstan-Russia migration – impact of demographic controls

(standard errors in parentheses)

number	Dependent variable	German ethnicity migration rate (to Russia)	Russian and other European ethnicity migration rate (to Russia)	Oblast divorce rate (divorces per 1000 women ages 18-44)	Oblast marriage rate (marriages per 1000 women aged 18-29)	Oblast crude birth rate (births per thousand women aged 18-44)	Oblast crude death rate for persons aged 60+
1a	Male 18-29 net migration as % of 18-29 male population	-0.0970 (0.1733)	0.0037 (0.0058)	13.7654* (7.6854)	-1.4884 (1.1081)	0.1199 (1.0779)	5.5326** (2.8074)
1b	Female 18-29 net migration as % of 18-29 female population	-0.1023 (0.2037)	0.0065 (0.0150)	15.7489* (9.6830)	-1.1073 (1.6750)	-0.8641 (2.0501)	6.1072* (3.2165)
2a	Male 30-44 net migration as % of 30-44 male population	-0.0085 (0.1093)	-0.0003 (0.0061)	2.2072 (6.3642)	-0.9951 (0.8690)	0.9735 (0.9578)	5.3300** (2.3167)
2b	Female 30-44 net migration as % of 30-44 female population	-0.0481 (0.1023)	-0.0009 (0.0054)	4.3348 (5.7819)	-1.2511 (0.8394)	0.2489 (0.8730)	6.3510*** (2.1912)
3a	Male 45-59 net migration as % of 45-59 male population	0.0273 (0.1277)	0.0039 (0.0088)	13.1729* (7.3267)	-1.4551 (1.2810)	0.2937 (1.3210)	7.5563*** (2.7756)
3b	Female 45-59 net migration as % of 18-29 male population	0.0718 (0.1801)	0.0000 (0.0141)	8.1283 (10.0237)	1.0669 (1.8022)	-1.2975 (1.8703)	7.7310** (3.8881)
4a	Male 60+ net migration as % of 60+ male population	0.1521 (0.1963)	-0.0058 (0.0109)	12.4205 (10.0263)	-0.8160 (1.7832)	0.6133 (1.7245)	6.0056 (4.4510)
4b	Female 60+ net migration as % of 60+ female population	-0.0208 (0.2399)	0.0038 (0.0200)	20.0684 (12.6880)	1.3877 (2.2256)	-0.0239 (2.4495)	9.2483* (5.3981)
5a	Male 18-29 net migration as % of 18-29 male population	-0.0199 (0.1607)	-0.0026 (0.0053)	17.6766** (7.2550)	-1.1135 (1.1399)	0.1594 (1.0335)	5.8591** (2.7042)
5b	Female 18-29 net migration as % of 18-29 female population	-0.0986 (0.1883)	0.0043 (0.0146)	15.1004 (9.8795)	-0.6953 (1.4778)	-0.0890 (1.8365)	5.8079* (3.1558)
6a	Male 30-44 net migration as % of 30-44 male population	0.0101 (0.1078)	-0.0027 (0.0060)	3.0589 (6.2217)	-0.2710 (0.9096)	0.8012 (0.9240)	3.7943* (2.2930)
6b	Female 30-44 net migration as % of 30-44 female population	-0.0146 (0.0962)	-0.0034 (0.0049)	4.1217 (5.2504)	-0.6218 (0.8512)	0.3113 (0.7531)	4.0941** (2.0794)
7a	Male 45-59 net migration as % of 45-59 male population	0.0098 (0.1212)	0.0034 (0.0087)	12.1275** (6.4774)	-1.2161 (1.3003)	0.9049 (1.2866)	6.7155*** (2.5392)
7b	Female 45-59 net migration as % of 18-29 male population	0.0621 (0.1670)	-0.0011 (0.0127)	6.8377 (9.3958)	2.8481 (1.7802)	-0.8027 (1.6605)	7.4686 (3.5607)
8a	Male 60+ net migration as % of 60+ male population	0.1131 (0.1812)	-0.0031 (0.0102)	8.0717 (9.1791)	-0.1910 (1.7111)	1.5940 (1.6509)	4.9016 (3.9764)
8b	Female 60+ net migration as % of 60+ female population	-0.0217 (0.2131)	0.0035 (0.0178)	9.6844 (12.0099)	2.2234 (2.0962)	0.8929 (2.3574)	9.8568* (5.3282)

*** significant at .01 level; ** significant at .05 level; * significant at .10 level

Table 6
Higher moments of the relative wage distribution (two-year lagged data) and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	Wage variance	Wage skewness	Wage kurtosis
1a	Male 18-29 net migration as % of 18-29 male population	-2.6724*** (0.5384)	-0.0031 (0.0029)	-0.0026 (0.0024)
1b	Female 18-29 net migration as % of 18-29 female population	-0.7982*** (0.2968)	-0.0118*** (0.0044)	-0.0023 (0.0026)
2a	Male 30-44 net migration as % of 30-44 male population	-1.2317*** (0.4065)	-0.0021 (0.0026)	-0.0035* (0.0021)
2b	Female 30-44 net migration as % of 30-44 female population	-0.2351 (0.1657)	-0.0062** (0.0026)	-0.0027* (0.0015)
3a	Male 45-59 net migration as % of 45-59 male population	-1.6860*** (0.5395)	-0.0026 (0.0033)	-0.0027 (0.0022)
3b	Female 45-59 net migration as % of 18-29 male population	-0.1288 (0.3087)	0.0014 (0.0045)	-0.0045* (0.0025)
4a	Male 60+ net migration as % of 60+ male population	-2.2952*** (0.7555)	-0.0056 (0.0053)	-0.0014 (0.0033)
4b	Female 60+ net migration as % of 60+ female population	-0.0925 (0.4208)	0.0069 (0.0062)	-0.0068* (0.0038)
5a	Male 18-29 net migration as % of 18-29 male population	-2.1110*** (0.4946)	-0.0015 (0.0026)	-0.0027 (0.0022)
5b	Female 18-29 net migration as % of 18-29 female population	-0.4969* (0.2652)	-0.0037 (0.0039)	-0.0022 (0.0025)
6a	Male 30-44 net migration as % of 30-44 male population	-0.9482** (0.4174)	-0.0001 (0.0025)	-0.0041** (0.0020)
6b	Female 30-44 net migration as % of 30-44 female population	0.1337 (0.1768)	-0.0017 (0.0023)	-0.0020 (0.0014)
7a	Male 45-59 net migration as % of 45-59 male population	-1.8848*** (0.5635)	-0.0028 (0.0034)	-0.0029 (0.0021)
7b	Female 45-59 net migration as % of 18-29 male population	0.4157 (0.3544)	0.0054 (0.0039)	-0.0099*** (0.0027)
8a	Male 60+ net migration as % of 60+ male population	-2.5669*** (0.7900)	-0.0058 (0.0050)	-0.0024 (0.0032)
8b	Female 60+ net migration as % of 60+ female population	0.5196 (0.4808)	0.0116* (0.0062)	-0.0109*** (0.0039)

*** significant at .01 level; ** significant(at .05 level; * significant at .10 level

Table 7

Higher moments of the relative wage and exchange rage distributions (two-year lagged data) and Kazakhstan-Russia migration

(standard errors in parentheses)

number	Dependent variable	Wage variance	Wage skewness	Wage kurtosis	Exchange rate variance	Exchange rate skewness	Exchange rate kurtosis
1a	Male 18-29 net migration as % of 18-29 male population	-2.5518*** (0.5575)	-0.0007 (0.0033)	-0.0042 (0.0029)	-0.0237 (0.0692)	0.0085* (0.0048)	-0.0030 (0.0033)
1b	Female 18-29 net migration as % of 18-29 female population	-0.7304*** (0.2890)	-0.0074 (0.0049)	-0.0047* (0.0028)	-0.1642* (0.0937)	0.0119** (0.0053)	-0.0026 (0.0037)
2a	Male 30-44 net migration as % of 30-44 male population	-1.0092** (0.4336)	0.0016 (0.0028)	-0.0052** (0.0023)	-0.0569 (0.0578)	0.0102*** (0.0041)	-0.0022 (0.0029)
2b	Female 30-44 net migration as % of 30-44 female population	-0.1381 (0.1656)	-0.0034 (0.0026)	-0.0046*** (0.0016)	-0.0459 (0.0559)	0.0149*** (0.0039)	-0.0060** (0.0027)
3a	Male 45-59 net migration as % of 45-59 male population	-1.5151*** (0.5604)	-0.0009 (0.0034)	-0.0046* (0.0025)	-0.1679** (0.0852)	0.0162*** (0.0065)	-0.0035 (0.0035)
3b	Female 45-59 net migration as % of 18-29 male population	-0.0941 (0.3036)	0.0015 (0.0044)	-0.0081*** (0.0030)	-0.0240 (0.1278)	0.0159** (0.0078)	-0.0121** (0.0052)
4a	Male 60+ net migration as % of 60+ male population	-2.3626*** (0.7765)	-0.0051 (0.0054)	-0.0027 (0.0038)	0.0311 (0.1171)	0.0119 (0.0093)	-0.0046 (0.0052)
4b	Female 60+ net migration as % of 60+ female population	-0.2023 (0.4195)	0.0067 (0.0062)	-0.0102** (0.0045)	0.1416 (0.1917)	0.0055 (0.0107)	-0.0134** (0.0069)
5a	Male 18-29 net migration as % of 18-29 male population	-2.0968*** (0.5143)	-0.0011 (0.0031)	-0.0035 (0.0027)	0.0446 (0.0606)	0.0065 (0.0043)	-0.0027 (0.0029)
5b	Female 18-29 net migration as % of 18-29 female population	-0.4674* (0.2647)	-0.0011 (0.0045)	-0.0032 (0.0027)	-0.0294 (0.0842)	0.0115* (0.0061)	-0.0032 (0.0036)
6a	Male 30-44 net migration as % of 30-44 male population	-0.8110* (0.4398)	0.0023 (0.0030)	-0.0045** (0.0022)	-0.0222 (0.0603)	0.0075** (0.0034)	-0.0004 (0.0024)
6b	Female 30-44 net migration as % of 30-44 female population	0.1628 (0.1771)	-0.0017 (0.0025)	-0.0029** (0.0015)	0.0946 (0.0594)	0.0141*** (0.0033)	-0.0071*** (0.0024)
7a	Male 45-59 net migration as % of 45-59 male population	-1.7785*** (0.5805)	-0.0016 (0.0034)	-0.0039* (0.0024)	-0.0714 (0.0800)	0.0134*** (0.0050)	-0.0027 (0.0029)
7b	Female 45-59 net migration as % of 18-29 male population	0.2428 (0.3597)	0.0029 (0.0043)	-0.0088*** (0.0030)	0.2872** (0.1269)	0.0158** (0.0071)	-0.0113** (0.0051)
8a	Male 60+ net migration as % of 60+ male population	-2.7641*** (0.8029)	-0.0065 (0.0051)	-0.0025 (0.0037)	0.1617 (0.1239)	0.0068 (0.0069)	-0.0030 (0.0048)
8b	Female 60+ net migration as % of 60+ female population	0.3724 (0.4819)	0.0123** (0.0062)	-0.0099** (0.0041)	0.5390** (0.2695)	0.0010 (0.0104)	-0.0072 (0.0081)

*** significant at .01 level; ** significant at .05 level; * significant at .10 level

Appendix 1: Additional regression results

Table A1
Relative employment and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	0.00004 (0.00034)	0.00066** (0.00030)	3	3	0.00066
1b	Female 18-29 net migration as % of 18-29 female population	-0.00056 (0.00042)	0.00087** (0.00038)	4	4	0.00087
2a	Male 30-44 net migration as % of 30-44 male population	-0.00013 (0.00030)	no	-	-	-
2b	Female 30-44 net migration as % of 30-44 female population	-0.00045 (0.00031)	no	-	-	-
3a	Male 45-59 net migration as % of 45-59 male population	-0.00033 (0.00043)	no	-	-	-
3b	Female 45-59 net migration as % of 18-29 male population	-0.00092 (0.00057)	no	-	-	-
4a	Male 60+ net migration as % of 60+ male population	0.00007 (0.00065)	no	-	-	-
4b	Female 60+ net migration as % of 60+ female population	-0.00108 (0.00080)	no	-	-	-
5a	Male 18-29 net migration as % of 18-29 male population	0.00017 (0.00029)	0.00074*** (0.00024)	4	7	0.00156
5b	Female 18-29 net migration as % of 18-29 female population	-0.00014 (0.00037)	0.00045** (0.00023)	5	5	0.00045
6a	Male 30-44 net migration as % of 30-44 male population	-0.00009 (0.00026)	0.00050** (0.00023)	3	3	0.00050
6b	Female 30-44 net migration as % of 30-44 female population	-0.00043 (0.00027)	0.00050** (0.00023)	3	5	0.001298
7a	Male 45-59 net migration as % of 45-59 male population	-0.00005 (0.00033)	-	-	-	-
7b	Female 45-59 net migration as % of 18-29 male population	-0.00035 (0.00053)	0.00082*** (0.00032)	5	6	0.00043
8a	Male 60+ net migration as % of 60+ male population	0.00049 (0.00053)	-	-	-	-
8b	Female 60+ net migration as % of 60+ female population	-0.00008 (0.00076)	0.00079* (0.00043)	5	5	0.00079

Table A2
Relative construction activity and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	0.0004 (0.0006)	0.0009** (0.0004)	4	4	0.00269
1b	Female 18-29 net migration as % of 18-29 female population	0.0004 (0.0006)	0.0014*** (0.0005)	4	4	0.00249
2a	Male 30-44 net migration as % of 30-44 male population	0.0005 (0.0005)	0.0007* (0.0004)	3	4	0.00131
2b	Female 30-44 net migration as % of 30-44 female population	0.0003 (0.0004)	0.0008** (0.0003)	4	4	0.00152
3a	Male 45-59 net migration as % of 45-59 male population	0.0002 (0.0005)	0.0010*** (0.0003)	4	4	0.00248
3b	Female 45-59 net migration as % of 18-29 male population	0.0003 (0.0006)	0.0016*** (0.0005)	4	4	0.00458
4a	Male 60+ net migration as % of 60+ male population	0.0004 (0.0005)	0.0014** (0.0006)	3	4	0.00366
4b	Female 60+ net migration as % of 60+ female population	-0.0001 (0.0006)	0.0019** (0.0008)	3	4	0.00549
5a	Male 18-29 net migration as % of 18-29 male population	0.0001 (0.0006)	0.0013*** (0.0004)	4	4	0.0030
5b	Female 18-29 net migration as % of 18-29 female population	0.0005 (0.0006)	0.0016*** (0.0006)	3	4	0.0047
6a	Male 30-44 net migration as % of 30-44 male population	0.0005 (0.0005)	0.0010** (0.0005)	3	4	0.0025
6b	Female 30-44 net migration as % of 30-44 female population	0.0002 (0.0004)	0.0010*** (0.0003)	4	4	0.0025
7a	Male 45-59 net migration as % of 45-59 male population	0.0003 (0.0005)	0.0012*** (0.0004)	4	4	0.0031
7b	Female 45-59 net migration as % of 18-29 male population	0.0010* (0.0005)	0.0030*** (0.0008)	3	4	0.0085
8a	Male 60+ net migration as % of 60+ male population	0.0003 (0.0005)	0.0015** (0.0006)	3	4	0.0028
8b	Female 60+ net migration as % of 60+ female population	0.0004 (0.0006)	0.0024*** (0.0008)	3	4	0.0056

Table A3
Relative investment and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	0.0125 (0.0085)	0.0293*** (0.0106)	2	2	0.0293
1b	Female 18-29 net migration as % of 18-29 female population	0.0194** (0.0100)	0.0429*** (0.0120)	2	2	0.0623
2a	Male 30-44 net migration as % of 30-44 male population	0.0103 (0.0069)	0.0223*** (0.0085)	2	2	0.0223
2b	Female 30-44 net migration as % of 30-44 female population	0.0103 (0.0091)	0.0240** (0.0102)	2	2	0.0240
3a	Male 45-59 net migration as % of 45-59 male population	0.0018 (0.0080)	No	-	-	-
3b	Female 45-59 net migration as % of 18-29 male population	0.0055 (0.0122)	No	-	-	-
4a	Male 60+ net migration as % of 60+ male population	0.0066 (0.0121)	No	-	-	-
4b	Female 60+ net migration as % of 60+ female population	0.0027 (0.0148)	No	-	-	-
5a	Male 18-29 net migration as % of 18-29 male population	0.0227*** (0.0076)	0.0299*** (0.0071)	2	7	0.0508
5b	Female 18-29 net migration as % of 18-29 female population	0.0108 (0.0082)	0.0294*** (0.0087)	2	2	0.0294
6a	Male 30-44 net migration as % of 30-44 male population	0.0107* (0.0062)	0.0207*** (0.0081)	2	2	0.0314
6b	Female 30-44 net migration as % of 30-44 female population	0.0144*** (0.0058)	0.0157*** (0.0053)	2	3	0.0427
7a	Male 45-59 net migration as % of 45-59 male population	-0.0016 (0.0072)	-0.0204* (0.0117)	5	6	-0.0378
7b	Female 45-59 net migration as % of 18-29 male population	-0.0029 (0.0104)	-	-	-	-
8a	Male 60+ net migration as % of 60+ male population	0.0051 (0.0110)	-0.0287* (0.0166)	5	5	-0.0287
8b	Female 60+ net migration as % of 60+ female population	0.0008 (0.0148)	-	-	-	-

Table A4

Relative industrial production and Kazakhstan-Russia migration

(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	-0.0045 (0.0226)	-	-	-	-
1b	Female 18-29 net migration as % of 18-29 female population	0.0022 (0.0300)	-0.0673* (0.0373)	4	4	-0.0673
2a	Male 30-44 net migration as % of 30-44 male population	-0.0120 (0.0187)	-0.0403* (0.0232)	4	4	-0.0403
2b	Female 30-44 net migration as % of 30-44 female population	-0.0215 (0.0165)	-0.0379** (0.0183)	4	4	-0.0379
3a	Male 45-59 net migration as % of 45-59 male population	-0.0176 (0.0227)	-0.0432* (0.0245)	4	4	-0.0432
3b	Female 45-59 net migration as % of 18-29 male population	-0.0111 (0.0329)	-	-	-	-
4a	Male 60+ net migration as % of 60+ male population	-0.0017 (0.0342)	-	-	-	-
4b	Female 60+ net migration as % of 60+ female population	-0.0212 (0.0454)	-	-	-	-
5a	Male 18-29 net migration as % of 18-29 male population	0.0176 (0.0205)	-	-	-	-
5b	Female 18-29 net migration as % of 18-29 female population	0.0595 (0.0403)	0.0689** 0.0351	5	5	0.0689
6a	Male 30-44 net migration as % of 30-44 male population	0.0040 (0.0250)	-	-	-	-
6b	Female 30-44 net migration as % of 30-44 female population	-0.0110 (0.0151)	-	-	-	-
7a	Male 45-59 net migration as % of 45-59 male population	0.0150 (0.0280)	-	-	-	-
7b	Female 45-59 net migration as % of 18-29 male population	0.0279 (0.0390)	-	-	-	-
8a	Male 60+ net migration as % of 60+ male population	0.0437 (0.0421)	-	-	-	-
8b	Female 60+ net migration as % of 60+ female population	0.0383 (0.0573)	0.1194** 0.0604	5	6	0.0252

Table A5

Relative RF/KZ inflation and Kazakhstan-Russia migration

(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	-0.0676 (0.1457)	-0.2294** 0.1093	3	3	-0.2294
1b	Female 18-29 net migration as % of 18-29 female population	-0.0776 (0.1684)	-0.2957** 0.1265	3	3	-0.2957
2a	Male 30-44 net migration as % of 30-44 male population	0.0225 (0.1079)	-	-	-	-
2b	Female 30-44 net migration as % of 30-44 female population	0.0123 (0.1020)	-	-	-	-
3a	Male 45-59 net migration as % of 45-59 male population	0.1440 (0.1308)	-	-	-	-
3b	Female 45-59 net migration as % of 18-29 male population	0.3424** (0.1677)	0.3424** (0.1677)	1	1	0.3424
4a	Male 60+ net migration as % of 60+ male population	0.1924 (0.1880)	-	-	-	-
4b	Female 60+ net migration as % of 60+ female population	0.3476 (0.2194)	-0.3425* (0.2106)	4	4	-0.3425
5a	Male 18-29 net migration as % of 18-29 male population	0.0535 (0.1339)	-0.1789* (0.1004)	3	3	-0.1789
5b	Female 18-29 net migration as % of 18-29 female population	-0.0648 (0.1655)	-0.2439** (0.1216)	3	3	-0.2439
6a	Male 30-44 net migration as % of 30-44 male population	0.0507 (0.1059)	0.1573* (0.0927)	4	4	0.1573
6b	Female 30-44 net migration as % of 30-44 female population	0.0208 (0.0936)	-	-	-	-
7a	Male 45-59 net migration as % of 45-59 male population	0.1899 (0.1335)	-	-	-	-
7b	Female 45-59 net migration as % of 18-29 male population	0.4349** (0.1781)	0.4349** (0.1781)	1	1	0.0678
8a	Male 60+ net migration as % of 60+ male population	0.1777 (0.1876)	-	-	-	-
8b	Female 60+ net migration as % of 60+ female population	0.4600* (0.2515)	0.4600* (0.2515)	1	4	0.0153

Table A6
Relative pensions and Kazakhstan-Russia migration
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) L1 standard error	Coefficient on peak lag effect	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population					
1b	Female 18-29 net migration as % of 18-29 female population					
2a	Male 30-44 net migration as % of 30-44 male population					
2b	Female 30-44 net migration as % of 30-44 female population					
3a	Male 45-59 net migration as % of 45-59 male population	0.0349 (0.0319)	-0.0663* (0.0377)	4	4	-0.0663
3b	Female 45-59 net migration as % of 18-29 male population	0.0007 (0.0396)	-0.1060** (0.0474)	4	4	-0.1060
4a	Male 60+ net migration as % of 60+ male population	0.1367*** (0.0480)	0.1367*** ((0.0480))	1	4	0.0004
4b	Female 60+ net migration as % of 60+ female population	0.0618 (0.0573)	-0.1932*** (0.0640)	4	4	-0.1932
5a	Male 18-29 net migration as % of 18-29 male population					
5b	Female 18-29 net migration as % of 18-29 female population					
6a	Male 30-44 net migration as % of 30-44 male population					
6b	Female 30-44 net migration as % of 30-44 female population					
7a	Male 45-59 net migration as % of 45-59 male population	0.0456 (0.0306)	0.0683** (0.0292)	3	3	0.1274
7b	Female 45-59 net migration as % of 18-29 male population	0.0849** (0.0393)	-0.1434*** (0.0501)	8	8	-0.1363
8a	Male 60+ net migration as % of 60+ male population	0.1312*** (0.0463)	0.1717*** (0.0626)	2	3	0.3990
8b	Female 60+ net migration as % of 60+ female population	0.1638*** (0.0597)	-0.1656*** (0.0623)	8	8	-0.1103

Table A7
Kazakhstan-Russia migration:
patterns of the lagged dependent variable
(standard errors in parentheses)

number	Dependent variable	One-quarter lag (L1) (L1 standard error)	Coefficient on peak lag effect (standard error)	Peak lag period	Maximum significant lag	Sum of coefficients for all significant (p < .10) lags
1a	Male 18-29 net migration as % of 18-29 male population	-0.2588*** (0.0662)	-0.2588*** (0.0662)	1	4	-0.3624
1b	Female 18-29 net migration as % of 18-29 female population	-0.2697*** (0.0887)	-0.2697*** (0.0887)	1	2	-0.5339
2a	Male 30-44 net migration as % of 30-44 male population	-0.2076*** (0.0736)	-0.2914*** (0.0638)	2	2	-0.4990
2b	Female 30-44 net migration as % of 30-44 female population	-0.3304*** (0.0666)	-0.3304*** (0.0666)	1	2	-0.6599
3a	Male 45-59 net migration as % of 45-59 male population	-0.4887*** (0.0756)	-0.4887*** (0.0756)	1	2	-0.9272
3b	Female 45-59 net migration as % of 18-29 male population	-0.5457*** (0.1050)	-0.5895*** (0.1128)	2	4	-1.5050
4a	Male 60+ net migration as % of 60+ male population	-0.5568*** (0.0860)	-0.5684*** (0.1236)	2	4	-1.4951
4b	Female 60+ net migration as % of 60+ female population	-0.6415*** (0.1220)	-0.7038*** (0.1484)	2	4	-1.9581
5a	Male 18-29 net migration as % of 18-29 male population	-0.3294*** (0.0591)	-0.3294*** (0.0591)	1	8	-0.9654
5b	Female 18-29 net migration as % of 18-29 female population	-0.3028*** (0.0783)	-0.3178*** (0.0739)	2	8	-0.9471
6a	Male 30-44 net migration as % of 30-44 male population	-0.2578*** (0.0604)	-0.3594*** (0.0639)	2	8	-1.0345
6b	Female 30-44 net migration as % of 30-44 female population	-0.3775*** (0.0562)	-0.4107*** (0.0646)	2	8	-1.2092
7a	Male 45-59 net migration as % of 45-59 male population	-0.4993*** (0.0723)	-0.4993*** (0.0723)	1	6	-1.3163
7b	Female 45-59 net migration as % of 18-29 male population	-0.5495*** (0.0894)	-0.6622*** (0.1086)	2	8	-2.1298
8a	Male 60+ net migration as % of 60+ male population	-0.5244*** (0.0671)	-0.6029*** (0.1111)	2	8	-2.0676
8b	Female 60+ net migration as % of 60+ female population	-0.6040*** (0.1056)	-0.7403*** (0.1429)	2	8	-2.3324

*** significant at .01 level; ** significant at .05 level; * significant at .10 level