**PIE Discussion Paper Series**

**March, 2005**

# FERTILITY AND MARRIAGE IN KAZAKHSTAN'S TRANSITION PERIOD:

## IMPLICATIONS FOR SOCIAL SECURITY POLICY [*]

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**Abstract :** (*JEL* classifications **G23**, P35, J26)
Seven years ago, Kazakhstan embarked on a dramatic reform of its pension and social security system in order to move from an unsustainable public defined benefit ("solidarity") system to one of defined mandatory contributions (accumulative system). While much has been written on the financial implications for individual contributors, and on macro budgetary impacts, there has been no examination of how changing demographic structure is likely to affect the size of vulnerable pools. This paper explores the impact of these changes, and links demographic structure to economic performance. Focusing on changes in nuptiality (marriage) and fertility, we conclude that demographic structural shifts will increase overall system risk, but that current trends are favorable.

[*] This research has been funded in part by the US Agency for International Development. We are grateful to the Statistical Agency of the Republic of Kazakhstan and the Pragma Corporation for data and logistical support. All errors and misinterpretations, however, remain our own, and the comments herein reflect policy neither of the Government of Kazakhstan nor of the United States of America.

# KAZAKHSTAN'S PENSION REFORM, MARRIAGE, AND FERTILITY

As of February 2005, seven years have passed since Kazakhstan began the transition from its public defined benefit ("Solidarity") system to a one of defined mandatory contributions held in individual accounts (Accumulative system). This reform and its performance to date are described in detail in Seitenova and Becker (2004). There have been many actuarial assessments of the new system, both in terms of its impact on the government budget (Weiner, 1997; Becker, Seitenova, and Urzhumova, 2000) and on individuals (Becker, Seitenova, and Urzhumova, 2000a). However, only Seitenova and Urzhumova (2003) make a serious effort to assess the likely accumulations of individual contributors in the light or realistic labor market assumptions.

In reality, however, most people do not live in isolation, so that the income and poverty impacts of alternative pension systems depend on living arrangements as well as payments to individuals. Moreover, the size of the able-bodied labor force, the labor force participation rate, and workers' earnings all will depend on demographic events. None of the forecasting exercises for Kazakhstan seriously consider the impact of demographic structure on outcomes, much less the possible endogeneity of demographic variables. Nor are projections for Kazakhstan unique in this regard: to our knowledge, there is no social security study of a middle-income country that has attempted to map individual pension payments to projected family incomes and poverty. Forecasts (such as Becker and Paltsev, 2004) that do incorporate demographic alternatives tend to base those on limited information, and focus on fiscal rather than poverty implications.

This paper takes a first step in addressing the lack of interaction between actuarial forecasts and demographic analysis by examining patterns in nuptiality and fertility in Kazakhstan, and relating them to likely poverty outcomes. The setting for this is a remarkable demographic recovery underway in Kazakhstan, with rapidly increasing marriage rates, and lagging but also recovering fertility. We argue below that these patterns will reduce the poverty incidence for elderly and disabled persons implied by the Accumulative pension reform. However, we argue further that these same events would have been equally or even more favorable for a continued Solidarity system. In general, the close tie between vital events and economic conditions will make forecasts more

sensitive to the economic environment assumed; we believe this implies as well that an Accumulative system may have greater built-in cyclicality.

Section 1 below explains the linkages between demographic structure and Accumulative system pension payments. We then turn to a discussion of patterns of marriage in Kazakhstan in Section 2. The third section links these patterns to the underlying economic environment. Section 4 discusses how different growth scenarios will affect underlying family structure, and hence social payments.

## I. Demographic structure and pension system payments

In a defined contribution, individual account Accumulative system, payments are made to individuals. Formally, contributors' account values $V$ are determined as the sum of individual contributions during their working lives, plus earnings on those contributions. Assuming that individuals have a potential working life defined by retirement age $R$, and prior to that age at any time $t$ have labor force participation rate $l(t)$, earn wage $w(t)$, make individual account contributions at rate $c(t)$, and earn a return $r(t)$ on their accumulated assets, then the value of an individual's account is defined by the first order differential equation

$$\begin{aligned} \dot{V}(t) &= l(t)\cdot c(t)\cdot w(t) \quad + \quad r(t)\cdot V(t) \\ V(0) &= 0 \end{aligned} \qquad \textbf{(1)}$$

Integrating over $t$ from 0 to $R$ then defines $V(R)$. This then maps into individual payments according to policy rules in force. If the group to which an individual is assigned (according to institutional rules) has retirement age life expectancy $T$, then the actuarially fair annuity payout rate $p$, plus administrative costs $a$, must satisfy

$$\begin{aligned} \dot{V}(t) &= -(p+a) \quad + \quad r(R)\cdot V(t) \\ V(T) &= 0 \end{aligned} \qquad \textbf{(2)}$$

Equations (1) and (2) define $p$ as an implicit function of $a$, $R$, $T$, $r(t)$, $l(t)$, $w(t)$, and $c(t)$. There are already plenty of ways in which marriage and fertility affect $p$ through these terms. The connection between $p$ and vital events is less simple mathematically if contributors receive a lump sum payment at retirement, or are allowed restricted scheduled withdrawals, with minimum state

pensions provided to those who outlive the amounts they have accumulated. In Kazakhstan today, the very small numbers receiving old-age accumulative pensions are given their accounts as a lump sum, with the expectation that the system will evolve toward one of scheduled withdrawals (as time goes on, and as the accounts people receive at retirement increase in size), and ultimately to annuities. This evolution in the nature of payouts means that there should be changes in the relationship between vital events and the income stream generated by pension accumulations. However, the nature of payouts is unlikely to change any of the signs involved.

As Cigno (1991) explains formally, marriage and births are especially important for women. Earnings and labor force participation rates are affected by marriage and fertility decisions; so, quite likely, are effective retirement ages. For men, these linkages are less important, and may well work in reverse fashion: married men are more likely to remain in the labor force, and at least in some countries are likely to earn higher wages. For women, marriage and childbearing are associated with lower participation likelihood, lower wages, and earlier retirement. Specifically, allowing subscripts to denote partial derivatives, and letting *ve* denote a vital event (either marriage or an additional child), lifetime optimization models lead us to expect for women that:

$$\begin{array}{lll} p_l \geq 0 & p_w \geq 0 & p_R \geq 0 \\ l_{ve} \leq 0 & w_{ve} \leq 0 & R_{ve} \leq 0 \end{array}. \qquad \textbf{(3)}$$

We also expect women to receive less education as these vital events occur; simultaneously, rising female education reduces fertility and delays marriage. In countries such as Kazakhstan, with narrow age ranges during which women marry, rising female education can be expected to reduce the likelihood of every marrying.

For men, the signs of the impacts of *l*, *w*, and *R* on *V* and *p* are the same as for women. However, the impact of vital events tends to have a reverse impact on these intermediary variables, and hence on *V* and *p*. Again following Cigno, the argument is straightforward: marriage enables specialization in activities, and women have a unique advantage in "home activities," while men are relegated to "market activities," in which they have a comparative if not absolute advantage. In a dynamic framework, moreover, the effects are compounded. Because married men are pushed to spend more time in the labor force, they acquire more work experience, which is rewarded with higher wages. A married couple realizes this as it solves its dynamic optimization problem, and therefore also emphasizes male education, as market returns will be higher. Education and

experience differentials compound time allocation factors, and also under most plausible comparative statics signings will discourage men from retiring early. In addition, marriage means greater care and home production, and hence a higher life expectancy for men, as has commonly been found empirically. Thus, for men

$$\begin{array}{cccc} p_l \geq 0 & p_w \geq 0 & p_R \geq 0 & p_T \leq 0 \\ l_{ve} \geq 0 & w_{ve} \geq 0 & R_{ve} \geq 0 & T_{ve} \geq 0 \end{array}. \qquad \textbf{(4)}$$

Beyond these indirect impacts of marriage and fertility on pension flows, it is important as well to recognize that an individual's consumption depends not only on his or her own earnings, but also on transfers from and to relatives, and especially from and to immediate family members – spouses and children. Defining net private transfers *PT* as the value of cash, income, and services received from others less the amount provided to others (mainly family members), then the total real income flow *TI* at any instant equals the sum of directly earned income *I*, net private transfers, net public transfers *GT*, pension system payouts, and rental income on assets *A*. This last term mainly consists of imputed rental income on housing. Formally,

$$TI = I + PT + GT + pV + \rho A \qquad \textbf{(5)}$$

For most pensioners – the elderly and disabled – $PT + GT + pV$ will be the main source of "visible" income. In an (exclusively) Accumulative system, $GT=0$, and the pension population will survive on payouts from its accumulated assets, and net private transfers.

The impact of *PT* on *TI* will depend on motivations for transfers. It seems reasonable to assume that the amount of private transfers an individual receives will depend on the person's income relative to the extended family or community's mean. Somewhat less intuitively, *PT* also should depend positively on the size of the extended family, *n*, at least for elderly persons. When *n* takes its minimum value, one, no transfers are possible. As *n* increases, there are increasing numbers of relatives who can provide support. Of course, increasing numbers also means more people who *need* support, especially young children. Thus, the impact of *n* on *PT* is in principle indeterminate, but pensioners consist of the elderly and disabled working-aged adults, and it seems most unlikely that more than a small proportion of the relatively poor among these people are net providers of

resources to other family members – at least in Kazakhstan. Since most large transfer recipients are outside the labor force, this claim is very close to the claim that household income inequality is less than individual wage inequality, which is essentially a universal pattern.

In effect, private transfers operate as an intra-extended family insurance scheme. Their presence therefore reduces the variance of total income within any given extended family. In any plausible model, this will also imply that the variance of total income for the entire population also will be reduced by the presence of private transfers. The same will hold true for the log variance of *TI*, and log variance $LVAR$ is a commonly used measure of inequality, and will be positively related to virtually any other plausible measure. Thus, $LVAR$ will be negatively related to *PT*, and hence to the proportion of total inequality that is intra- rather than extra-household. And, at least for the elderly population, *PT* will be positively related to household size, *n*.

To continue the model, inequality among the elderly will therefore be related negatively to household size. Household size, in turn, is positively related to fertility and marriage; fertility is also positively affected by marriage. Put simply, a society with large, strong extended families will have lower degrees of inequality that societies composed of small atomistic units. Furthermore, if we restrict our observations to pension recipients, societies with a high incidence of marriage and high birth rates will have larger families *n* and therefore larger transfers to the elderly, and therefore less inequality among the elderly. This is especially true in societies without public pension systems, and in particular without defined benefit systems. Such Solidarity systems provide "competing" transfers, thereby reducing the need for *PT* and crowding them out.

This chain of logic is important, as it implies that the vital events examined below will have key implications for the extent of poverty among the elderly and disabled under the new Accumulative system. The collapse in marriage and fertility implies sharp reductions in family sizes, eventually generating a relatively large population at risk. In principle, this effect could be offset among women by the impact of falling marriage and fertility on increased labor force participation, education, wages, and retirement age. In practice, especially given Kazakhstan's public policy that mandates premature retirement for women, and historically high female labor force participation rates, these effects seem likely to be secondary, especially for poor women.

We therefore conclude that weakening of the Kazakhstani family system is likely to raise long run income inequality among the elderly, and hence the incidence of elderly poverty. This will be especially true given the adoption of the Accumulative system. Conversely, recovery of family relationships will reduce the inegalitarian aspects of Kazakhstan's pension reform.

## II. Patterns of marriage and fertility

The vital events that receive the most attention in Kazakhstan concern migration and the resulting population loss, and increased mortality. However, with independence and the ensuing economic crisis, the nation also experienced a collapse in the incidence of marriage and a sharp decline in birth rates. Nor were these declines unique to Kazakhstan: Becker and Hemley (1998) document similar declines for other former Soviet republics. The marriage and fertility declines for Kazakhstan were quite large, though, and as Tatibekov (2004) documents, closely interlinked. We examine these patterns for clues as to how economic and social variables influence fertility and, mainly, marriage. These patterns and underlying theory will then be used to estimate econometric relationships; we can then examine how future economic scenarios are likely to affect vital events.

The patterns of crude marriage rates for Kazakhstan appear in Table 1 and Figure 1. Nationally, the crude marriage rate declined from 10.1 marriages per thousand population in 1991 to only 5.8 in 1999, a 43% decline (Tatibekov, 2004). While some of this decline might have been due to failure to register marriages with state authorities, that cannot be the story. However, as Tatibekov points out, in recent years more than one-quarter of all births have been out of wedlock – an astonishing rate for a country that is slightly more than half Moslem.

As the figures show vividly, the decline in marriage rates was a national phenomenon. Relative to 1991 rates, the proportionate decline ranged from a low of 27% (in heavily Russian Akmolinskaya oblast) and 28% (in heavily Kazakh Mangistau) to extremes of 51% in West Kazakhstan and 50% in Zhambyl (both heavily Kazakh). The decline continued beyond the economic nadir, in most oblasts not bottoming out until 1999. This pattern suggests that marriage is linked to economic performance, but not in a simplistic fashion. Both prospective husbands and wives are likely to be reluctant to enter into a marriage under uncertain economic circumstances. Especially from a woman's perspective, marrying a man who is likely to be poorly paid or

unemployed increases the risk that she will end up a single mother, trying to support both herself and her children. At the same time, marriage ceremonies can be expensive, so that during economic crisis, fewer families will be able to finance marriages. A relationship that incorporates both of these effects is one in which the current marriage rate *m* is a function both of current earnings *w* (proxied for by per capita income or related variables) and projected earnings' growth. In a simple myopic model, expected earnings will therefore depend on past growth (and, hence, both current and past levels). In a disequilibrium adjustment model, expected earnings also will depend on (a) past peak values – in our data set, 1991 values, and (b) the current peak value across all oblasts. Thus, denoting time by *t* and oblast by *i*, we anticipate a relationship of the sort:

$$m_{i,t} = f(w_{i,t}, \Delta w_{i,t}, w_{i,1991}, w_{peak,t}) = g(w_{i,t}, w_{i,t-1}, w_{i,1991}, w_{peak,t}) \quad \textbf{(6)}$$

The second point to notice from Figure 1 is that crude marriage rates are universally higher in predominately Kazakh regions. This reflects the younger age structure of these regions (in turn reflective of higher birth rates), greater demand for children (a major reason for marriage) among ethnic Kazakhs, and stronger social traditions. Thus, a marriage equation based on (6) also should incorporate an ethnicity variable $KAZPCT_{i,t}$.

The third salient feature of the data is the remarkable recovery in marriage rates that has occurred. The proportionate increases seem to have been highest in some of the predominately Kazakh regions. In particular, the 2003 crude marriage rate was 41% above its lowest value in West Kazakhstan, 40% greater in Aktyubinsk, 38% greater in South Kazakhstan, and 37% higher in Zhambyl. It also appears that the proportionate recovery is greatest in oblasts that suffered the largest declines. This implies that marriage level is not independent of long run levels, which in turn depend on specific characteristics of a given region. One way to handle this is with regional binary variables to pick up fixed effects. Alternatively – and our current preference – we will run regressions that treat the 1991 *m* values as exogenous.

Table 2 and Figure 2 present a fourth characteristic of marriage in Kazakhstan: it is highly age-specific, especially for women. About half of all marriages even in recent years are to women aged 20-24; more than two-thirds of marriages are to women under 25 years old; and some 85% of

marriages are to women under 30. Given this age specificity, it is obvious that the crude marriage rate will depend on the population's demographic structure, and, specifically, to the proportion of the population aged 20-24. Thus, a modified marriage function for purposes of regression will take the form

$$m_{i,t} = g(m_{i,1991}, w_{i,t}, w_{i,t-1}, w_{i,1991}, w_{peak,t}, KAZPCT_{i,t}, POP20\_24_{i,t}) \quad \textbf{(7)}$$

Figures on the incidence of marriage from neighboring but considerably poorer Kyrgyzstan (NSCKR, 2004) offer further insights into the nature of marriage in the region. To start with, the decline in marriage is mirrored in Kyrgyzstan. Using 1990 and 1992 averages as a base, the crude marriage rate decline at the national level peaked at 48% in 2000; since then, there has been a 39% recovery. The decline was smallest in remote, poor, overwhelmingly Kyrgyz Naryn oblast (-23%); the decline was by far the largest (-56%) in the cosmopolitan capital, Bishkek, which also has a large Slavic population. Out of wedlock birth patterns do not suggest that conservative Moslem regions are no longer registering marriages. Rather, while some 30% of births in 2003 nationwide, and 41% of births in Bishkek were to unmarried women, only 9% of those in conservative Osh (but 33% of those in outlying Osh oblast) were out of wedlock. Finally, the age specificity of marriage is even greater in Kyrgyzstan than Kazakhstan. In 2003, 88.2% of Kyrgyz marriages were to women under 30, as were 91.5% of first marriages; 75% of first marriages were to women under 25.

The description thus far suggests that the reaction to expected economic prospects will differ across regions. Conservative, naturally poorer regions seem likely to experience smaller variation overall in marriage, and likely quicker recovery. Hence, the relationship described in (7) will not be linear, but will be better described by a function that is either log linear, or that contains specific interaction effects between income/wealth variables that proxy for expected wages, and past and current peak income and marriage terms. It is also possible that the ethnic effects will be entirely captured by base *m* and *w* terms.

Indeed, it is possible that two very different trends are underway in Kazakhstan and other former Soviet republics. Especially in more traditional areas, the marriage recovery noted for Kazakhstan and Kyrgyzstan is underway. At the same time, though, in parts of the former USSR, living arrangements are evolving toward "Scandinavian" (very low marriage, very high out-of

wedlock birth, and a total fertility rate moderately below replacement) or "Western European" (low marriage, high out-of-wedlock birth, and an extremely low TFR) models. In Latvia (CSBL, 2003), for example, the crude marriage rate (for women only) declined by 56% between 1991 and 2000, and rose only 6% by 2002 from the 2000 nadir. In 2002, only 41% of Latvian women marrying were under 25; a larger share, 42%, was over 30. The total female first marriage rate (TFFMR – the likelihood that a woman will ever marry at current age-specific rates) in Latvia declined from 96% in 1988 to 88% in 1991, and thence to 40% in 1998-2000, before recovering to 44% in 2002. Extra-marital births in Latvia have been steadily increasing, rising from 18% of all births in 1991 to 43% in 2002. During this period, the TFR declined from 1.85 to 2.23 – in essence, giving Latvia Scandinavian marital patterns and Western European fertility. To the extent that Kazakhstanis of Slavic ethnicity are more likely to follow this Baltic pattern than are Kazakhs and other Moslem Kazakhstanis, the ethnicity variable suggested above remains appropriate.

The data in Table 3 suggest that Kazakhstan is not entirely dissimilar to Latvia, at least at its low point. Kazakhstan's 2000 TFFMR was only 62% (and Becker and Paltsev, 2004, report an even lower rate for Kyrgyzstan in 1997). In other words, at year 2000 age-specific marriage rates, some 38% of Kazakhstani women will never marry, which is a huge decline in a society where, until independence, only a small fraction of people never married. Moreover, since in many conservative, rural areas, marriage rates remain high, it is likely that TFFMRs in the larger cities fell to 50% or lower at the trough. In addition, since many marriages will end in divorce or widowhood, it also appears that, at 2000 rates, for no age group will more than 43% of women be married at any point.

The situation for men is naturally similar, though slightly less dire. Marital age is not as concentrated for men as it is for Kazakhstani women (Table 2). More importantly, there are weaker social constraints to men marrying later, so that the dramatic decline in marriage rates should have a less permanent effect for men. Indeed, one would expect to see a secular increase in mean age at first marriage (AFM) for both men and women since Independence, and also an increasing gap. Financial constraints will lead to marriage postponement as well as delay, and, with economic recovery, social constraints to marriage after traditional ages clearly has lessened. Since these financial constraints limited men more than women, and since the age constraint is weaker for men, with economic recovery one would expect to see a surge in "late" marriage among men. These patterns do in fact emerge in Table 3. There is no clear trend during the period 1990-97 for either

men or women, but since then, AFM has been rising for both genders. Moreover, the gap has widened: in 1990, AFM was 24.5 for men and 22.3 for women, with a gap of 2.2 years. By 1997 this gap had increased to 2.5 years; in 2002, with AFM of 26.6 for men and 23.3 for women, the gap had increased to 3.0 years.

This is not to say that men are in a markedly better position. The rise in AFM of only two years over a 12-year period does not suggest that a far higher proportion of men than women will ultimately marry. And, as has long been known, from a health standpoint, unmarried status is far more damaging to men than women.

The decline and recovery in marriage has been mirrored by a corresponding decline and rise in the total fertility rate (TFR) since independence (Figure 4). Kazakhstan's TFR declined moderately but fairly steadily from its post-war baby boom peak in the 1950s to about 3.0 in the early 1980s. There was a modest recovery during the late Gorbachev era, and then a downward plunge from a TFR of 3.16 in 1987 to a low of 1.76 in 1999. Since then, fertility has recovered to 2.03 in 2003; since births normally lag marriage trends by a couple years, further increases are likely.

For women under 45, the largest declines in age-specific birth rates between 1990 and the 1999 trough were for women under 25: births declined by 42.5% for teenagers, and by 43.4% for women aged 20-24 (Figure 5). For women aged 25-34, the declines were just under 30%. The recovery to date has not mirrored the decline. Teenage births have declined a further 17.2%; births to women 20-24 have risen 9.8% (to 1997 levels, approximately); and births to women aged 25-29 have risen 16.5% (nearly to 1995 levels). The large increases are among older, married women: for women aged 30-34, the 1999-2003 increase was 27.2% (roughly to 1991 levels), and for women aged 35-39, births rose a remarkable 51.8%, to a level not seen since the 1980s.

To complete the picture of Kazakhstan's fertility, we present data on rural-urban fertility differences by age (Figure 6). There is a differential in favor of rural areas, but it is small by most countries' standards. Finally, Figure 7 presents the secular rise in non-marital births that have occurred since shortly after independence. Non-marital births nearly doubled as a proportion of all births between 1993 and 2001, and now account for roughly one-quarter of all live births.

## III. Estimating the determinants of marriage

The next step is to convert theory, adjusted for our perception of patterns, into an estimating equation, or system of equations. Doing this requires us to consider alternative proxies for earnings, and we introduce several distinct wealth measures. We also alternately look at levels-on-levels and first differences models. Finally, while initial regressions are based on OLS runs, we then turn to simultaneous equations modeling.

Initial regression results to explain determinants of crude marriage (CMR) rates appear in Table 4. The data cover CMR values from 1991-2003 by oblast. We show several alternate specifications, since *a priori* it is not certain which measures will be the best proxies for current wealth and expected future earnings. However, our regressions turn out to be highly robust for many but not all variables.

Controlling for demo-economic variables, the time dummies exhibit a regular pattern, becoming increasingly negative until 1999, at which point the dummy is about 58% of the mean CMR value. A slight improvement occurs in 2000 and 2001; a more substantial improvement takes place in 2002, and even greater improvements occur in 2003. The 2003 time dummies are about 30% smaller in absolute value than the 1999 values, or about 40% of the mean CMR value. Note that the actual rise in CMRs is still greater, but much of that reflects the improving economic climate. Apparently, Kazakhstan is not destined to look like Latvia after all.

The only behavioral variables comparable in significance to the time dummies are the ethnic Kazakh share of the population (with *t*-statistics between 8 and 9) and the rate of private automobile ownership (with *t*-statistics between 4 and 5). There is clearly a huge difference in marriage incidence between Kazakhs and ethnic Europeans: the coefficient on Kazakh ethnic share is roughly one-third of the mean CMR value. There is also an unmistakable wealth effect, as one would expect in a society that values expensive ceremonies. However, it is apparent from regression (4) that the automobile ownership variable shows up as a positive variable only when the Kazakh population share variable is included. The reason for this is that of strong omitted variables' bias effect, since automobile ownership is negatively correlated with Kazakh population share, and Kazakhs are more likely to marry.

Frankly, we were surprised that so many of the measures of current economic climate were strongly significant and positive in the same regression, as we expected to find strong multicollinearity. This was actually not the case: industrial share of oblast gross regional product is actually negatively correlated with automobile ownership, and barely positively correlated with construction activity. Even wages and industrial share of GRP have a simple correlation coefficient of only 0.49

But while indicators of economic prosperity are not highly correlated, virtually all contribute to increased incidence of marriage. This is especially true for industrial share, but construction activity – an obvious indicator of labor market conditions for young men – is highly significant as well.[1] The industrial and housing construction coefficients are surprisingly stable, both when other terms are omitted or excluded, and when the period of analysis is changed (Table 5). Indeed, while our population structure share variable is positive and significant, the economic measures tend to be more significant. This is surely a new pattern, as historically demographic structure would have been the key determinant.

Naturally, though, population structure does matter. The very high age concentration of marriage also can be seen by comparing regressions (1)-(3) with regressions (4)-(6). If marriages were evenly distributed throughout ages 20-29, then using the population share age 20-24 instead of 20-29 would roughly double the coefficient. In fact, the coefficient size rises by a factor of three to four in comparable specifications.

Finally, we expected net emigration to have a negative effect on marriage. Along with the wage, construction, industrial share, and automobile ownership variables, we expected high emigration rates to signal depressed local conditions and pessimism about the future. In principle, migration could have positive sign, since most migrants are young adults of marriageable age, and flows are dominated by emigration. However, migration in Kazakhstan is not nearly as age-specific

[1] There is some risk of simultaneity bias, but our judgment is that the vast majority of new housing consists of upgrading by established households, rather than construction for newlyweds. Nonetheless, new households do create demand at the lower end of the housing market, thereby enabling other households to move into new units, and hence creating a potential simultaneity problem. Rather than following an IV approach (we do not have a wide selection of instruments), we include regressions with and without the housing variable.

as elsewhere, so that this effect is likely to be small. As it turns out, the migration variable does have a negative and significant sign, though in some regressions the significance level is not high. Our final demographic structural variable, urban population share, is also insignificant, at least when the age structure is included.

This last point leads to our main empirical problem: while economic variables are not terribly collinear, demographic variables are. Kazakh ethnicity is a critical determinant of marriage rates, and omitting it influences the signs, sizes, and significance levels of many other variables. Absent a Kazakh population, automobile ownership becomes negative for reasons noted above, and the population share terms double in size (since Kazakhs are younger than the European population, and more likely to marry). The effect can also be seen in the coefficients of the dummy variables that pick up year effects. Contrasting regressions (4), (6), and (9)-(11) with the other regressions, it is clear that the more recent time dummies fall in value and significance when the Kazakh share is omitted. The reason for this is simple: between 1991 and 2003, the ethnic Kazakh share of the population rose from 41% to 57%. Thus, some of the marriage rise is attributable to a growing population share of an ethnicity with a higher than average propensity to marry and, as can be seen from examination of equations with and without population shares, of growth in the proportion of the population of marriage age (itself driven by the post-Soviet fertility slowdown).

Table 5 examines determinants of crude marriage rates over a shorter period, from 1994-2003. It is impossible to construct a plausible real wage series that includes the chaotic transition years 1992-93, and therefore examining wage effects forces us to reduce our series. The same is true for our employment variables – the shift from Soviet to market-based practices makes a continuous series difficult to interpret.

While other economic variables remain significant, the wage term is not significant, except for when omitted variables' bias makes it so. When the Kazakh ethnicity term is omitted, the wage variable becomes positive. However, economically prosperous areas have seen rapid growth in the Kazakh population share: to give an extreme example, the new capital city of Astana has gone from being 19% Kazakh in 1994 to 55% Kazakh in 2003. Since wages are high and rising in these areas, a

regression with a Kazakh ethnicity term is virtually observationally equivalent to one with a wage term; when both are included, the wage term is insignificant. Since wage and employment variables are not generally significant while housing construction and industrial share terms are, we somewhat comfortably infer that these latter terms are better indicators of long run socio-economic prospects. This is plausible in that wages and employment measures are aggregated over occupations and age groups, and hence likely of limited relevance to young households – while construction is more closely related to young adult labor demand.

Note as well that the use of 1994 rather than 1991 as the year dummy comparator changes coefficients and significance levels markedly. In regressions (7) and (8), even with a Kazakh ethnicity variable, neither the 2002 nor 2003 year dummies are significantly different from zero. In effect, while full recovery in marriage has not occurred, Kazakhstan has returned to its 1994 pattern.

## IV. Economic recovery and demographic structure

The regressions in Section III give reason for optimism. Combined with recovery of Kazakhstan's TFR in recent years – from a low of about 1.75 to a revived 2.03 in 2003 – it seems clear that Kazakhstan has veered away from the Scandinavian, Western European, or Baltic marriage and birth rate paradigms. This is of critical importance for the Accumulative pension system, as family structure will have a very large role to play in the impact of the system on poverty.

The reason that demographic structure is so important to pension system policymakers is obvious from Table 6, which presents two very different scenarios. This analysis is preliminary: the regressions reported in the preceding section have severe limitations, as they are simple OLS analyses of crude marriage and birth rates. Ultimately, we need to estimate simultaneous equations systems of age specific rates, controlling for correlation of residuals, and paying attention to the lag structure. Until we do that, it is only possible to get general guidance from the regressions. We choose to allow Kazakhstan's marriage patterns to continue to recover, as economic prosperity continues, and as the population becomes increasingly Kazakh in ethnicity. However, in the recovery scenario, we also assume that the rise in age of first marriage is permanent, and allow age-

specific rates to drift upward. We further assume that the effective divorce rate declines, and that the male mortality rate (and hence the risk of widowhood) also returns to 1990 levels.

These assumptions are obviously optimistic, but make for a striking contrast with a scenario in which 2000 marriage rates continue indefinitely, assuming that they started in 1995. We focus on the proportion of women likely to be unmarried around age of retirement (which we take as a simple unweighted average of women at age 54, 59, and 64). In the recovery scenario, between 58% and 62% of all women in this age group will be married between 2020 and 2040. A decline will inevitably be observed over this period, since a cohort of women has already passed through years at which marriage is likely without marrying. We assume in the recovery scenario that this cohort is only 10 years in duration (namely, women born between 1975 and 1985); in reality, the duration may be a bit short, and hence the decline that will occur is understated. We also assume that some of those who have not yet married will do so in the future as the marriage age distribution shifts – again, we might have overstated the shift.

It is clear, though, that the recovery is vastly different from the situation that will emerge if marriage does not recover. The proportion of women at retirement age who are married will steadily fall, eventually declining to less than 25%.

This is where pension policy is affected. Since women earn less, spend more time out of the labor force, and are less likely to be in formal sector employment, the obligations of a public social safety net that lies beneath an individual account accumulative system will be much greater if 75% to 80% of women are single at retirement age than if only 40% are single. The problem is a serious one in either case, but the low marriage scenario suggests minimum pension expenditures that could be twice that of the demographic recovery scenario. In principle, Kazakhstan could of course abandon its commitment to paying a minimum pension of any significance, but the government's recent behavior suggests it will do otherwise. The elderly are a visible and vocal group, and in a pluralistic society, the poor among them are likely to receive support.

We believe that the optimistic recovery scenario is far more likely than the pessimistic scenario in which year 2000 patterns continue indefinitely. In that case, demographic recovery adds to the virtuous cycle. Increased incidence of marriage today will map into reduced female poverty in

the future, and hence lower levels of government social payments. The distributional impact of the accumulative system also will be more benign than forecasts based on individual earnings' distributions suggest.

To the extent that Kazakhstan's pension reform has contributed to economic recovery, but creating a pool of domestic savings, and accelerating development of the nation's financial sector, the virtuous cycle is clear. Recent economic growth in turn has spurred the recovery in marriage, apparently arousing passions more effectively than conventional aphrodisiacs. The consequences include long run reductions in inequality and demands on public expenditures, thereby freeing resources for more productive and further growth-enhancing uses.

Ironically, though, the economic recovery is also good – and possibly better – for a conventional PAYGO social security system. Economic growth means an expanding payroll contribution base, along with fewer unemployment and disability payments. The marriage effect also translates into higher fertility, and hence a larger base of the pyramid to finance PAYGO retirement payment to today's workers when they age.

Thus, the moral is that economic growth creates more than one virtuous cycle through its demographic consequences. Both a system based on individual accumulative accounts, with a minimum safety net, and a defined benefit PAYGO system will be easier to cover because of demographic feedbacks when economic recovery takes place.

Table 1. Marriages per 1,000 population, Kazakhstan 1991-2003

| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Akmolinskaya** (incl. Astana) | 7.3 | 6.2 | 6.4 | 5.5 | 6.5 | 5.7 | 6.5 | 6.0 | 5.6 | 6.0 | 5.3 | 5.7 | 6.8 |
| **Aktybinskaya** | 10.4 | 8.9 | 8.7 | 7.4 | 7.4 | 6.8 | 6.1 | 6.1 | 5.5 | 6.3 | 6.2 | 6.6 | 7.7 |
| **Almatinskaya** (incl. Almaty) | 10.5 | 9.1 | 8.8 | 7.6 | 7.6 | 6.7 | 6.9 | 6.7 | 6.3 | 6.4 | 6.8 | 7.6 | 8.2 |
| **Atyrauskaya** | 9.8 | 9.1 | 8.9 | 7.3 | 7.5 | 7.3 | 7.2 | 7.5 | 6.7 | 7.6 | 7.6 | 8.0 | 8.4 |
| **Vost.-Kazakhstanskaya** | 9.7 | 8.7 | 8.9 | 7.2 | 7.1 | 6.6 | 6.4 | 6.0 | 5.4 | 5.8 | 5.9 | 6.5 | 6.8 |
| **Zhambylskaya** | 10.1 | 9.3 | 8.7 | 7.0 | 6.6 | 5.7 | 6.0 | 6.3 | 5.1 | 5.6 | 6.0 | 6.2 | 7.0 |
| **Zap.-Kazakhstanskaya** | 10.4 | 8.7 | 9.0 | 7.5 | 7.0 | 6.4 | 6.3 | 5.4 | 5.1 | 5.7 | 6.1 | 6.5 | 7.2 |
| **Karagandinskaya** | 9.6 | 8.6 | 8.5 | 7.3 | 7.3 | 6.4 | 6.6 | 6.3 | 5.8 | 6.2 | 6.2 | 6.6 | 7.3 |
| **Kostanayskaya** | 9.5 | 8.0 | 8.2 | 7.3 | 7.2 | 6.3 | 6.5 | 6.0 | 5.7 | 5.7 | 5.9 | 6.1 | 6.7 |
| **Kyzyl-Ordinskaya** | 11.2 | 10.4 | 10.2 | 8.3 | 8.1 | 7.1 | 7.7 | 7.4 | 6.5 | 7.2 | 7.0 | 7.3 | 7.9 |
| **Mangistauskaya** | 10.1 | 9.0 | 9.0 | 7.9 | 8.1 | 7.6 | 7.4 | 7.6 | 7.3 | 7.6 | 8.0 | 8.4 | 8.8 |
| **Pavlodarskaya** | 9.6 | 8.5 | 8.7 | 7.9 | 8.0 | 6.5 | 6.9 | 6.5 | 6.3 | 6.1 | 6.2 | 6.6 | 7.1 |
| **Sev.-Kazakhstanskaya** | 9.7 | 8.3 | 8.7 | 7.4 | 7.9 | 7.0 | 6.3 | 5.7 | 5.1 | 5.5 | 5.2 | 5.6 | 6.3 |
| **Yuzh.-Kazakhstanskaya** | 10.7 | 9.3 | 9.7 | 8.1 | 7.5 | 7.0 | 6.7 | 6.6 | 5.5 | 5.8 | 6.3 | 6.4 | 7.6 |

Table 2 Distribution of marriages by age, Kazakhstan 2000

| Fiancée age | | | Fiancé age | | |
|---|---|---|---|---|---|
| | Number of marriages | % | | Number of marriages | % |
| under 18 | 1,934 | 2.1% | under 18 | 183 | 0.2% |
| 18-19 | 16,500 | 18.2% | 18-19 | 3,916 | 4.3% |
| 20-24 | 43,615 | 48.0% | 20-24 | 36,838 | 40.5% |
| 25-29 | 15,076 | 16.6% | 25-29 | 27,338 | 30.1% |
| 30-34 | 5494 | 6.0% | 30-34 | 10338 | 11.4% |
| 35-39 | 2969 | 3.3% | 35-39 | 4781 | 5.3% |
| 40-44 | 1736 | 1.9% | 40-44 | 2580 | 2.8% |
| 45-49 | 1199 | 1.3% | 45-49 | 1604 | 1.8% |
| 50-54 | 837 | 0.9% | 50-54 | 1034 | 1.1% |
| 55-59 | 434 | 0.5% | 55-59 | 541 | 0.6% |
| 60+ | 1051 | 1.2% | 60+ | 1708 | 1.9% |
| Age unknown | 28 | 0.0% | Age unknown | 12 | 0.0% |
| | 90,873 | 100.0% | | 90,873 | 100.0% |

| Table 3: Female Marital Coefficients, Kazakhstan 2000 | | | | | | |
|---|---|---|---|---|---|---|
| Age | Annual incidence of first marriage | Annual incidence, all marriages | Annual incidence of Divorce | Annual incidence of widowhood | Net marriage rate | Likelihood of being in a marital union |
| <18 | 0.44 | 0.45 | 0.00 | 0.00 | 0.90 | 0.90 |
| 18-19 | 5.68 | 5.70 | 0.09 | 0.02 | 5.55 | 12.00 |
| 20-24 | 6.46 | 6.61 | 0.65 | 0.14 | 5.50 | 39.50 |
| 25-29 | 2.22 | 2.59 | 1.17 | 0.19 | 0.65 | 42.75 |
| 30-34 | 0.70 | 1.08 | 1.01 | 0.22 | -0.65 | 39.48 |
| 35-39 | 0.26 | 0.51 | 0.71 | 0.25 | -0.80 | 35.46 |
| 40-44 | 0.11 | 0.31 | 0.53 | 0.32 | -0.80 | 31.44 |
| 45-49 | 0.05 | 0.26 | 0.39 | 0.41 | -0.73 | 27.79 |
| 50-54 | 0.04 | 0.22 | 0.25 | 0.58 | -0.73 | 24.14 |
| 55-59 | 0.04 | 0.20 | 0.16 | 0.64 | -0.68 | 20.74 |
| 60+ | 0.03 | 0.10 | 0.05 | 1.19 | -1.16 | 3.27 |
| Total marriage rate | 62.38 | 73.75 | | | | |

Source: Goskomstat RK, 2001.

Notes: All data are expressed as percentages. Marriages below age 18 are assumed to be for women aged 15-17. Population data for 15-19 year-olds is pro-rated. Widowhood risk is taken as male mortality rate for men of comparable ages, with marital age differential assumed offset by lower mortality for married men, and adjusted for proportion of women married. Divorce incidence is increased by 50% in calculating net marriage rates and proportion of women in marital union rates, to account to unregistered divorces. Likelihood of being in a marital union refers to end of period, or age 75 for those aged 60+.

TABLE 4

DETERMINANTS OF CRUDE MARRIAGE RATES, KAZAKHSTAN 1991 – 2003

| LEVELS ON LEVELS OLS REGRESSIONS I | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) OLS | (6) OLS |
|---|---|---|---|---|---|---|
| Constant | 5.868*** | 5.768*** | 5.485*** | 4.129*** | 5.704*** | 3.340*** |
| Share of total population aged 20-29 years x100 | 7.310 | 8.907* | 10.868** | | | |
| Share of total population aged 20-24 years x100 | | | | 55.573*** | 29.130*** | 62.618*** |
| Ethnic Kazakh share of total population x100 | 2.709*** | 2.765*** | 2.661*** | | 1.568*** | |
| Net external migration/100,000 population | | -8.653** | | | | |
| Urban share of total population x100 | 0.466 | | | | | |
| Housing construction ($m^2$)/100,000 population | 0.113** | 0.106** | 0.112** | 0.327*** | 0.224*** | 0.320*** |
| Employed population as % of economically active population (EAP) | | | | | | |
| Self-employment as % of EAP | | | | | | |
| Hired employment as % of EAP | | | | | | |
| Industrial share of GDP x100 | 0.918** | 1.044** | 1.184*** | 1.454*** | 1.194*** | 1.567*** |
| Private automobiles/100,000 population | 1.271*** | 1.361*** | 1.318*** | -0.488** | | |
| Average real wage | | | | | | |
| 1992 time dummy | -1.255*** | -1.316*** | -1.260*** | -1.072*** | -1.513*** | -1.099*** |
| 1993 time dummy | -1.139*** | -1.267*** | -1.137*** | -0.878*** | -1.022*** | -0.926*** |
| 1994 time dummy | -2.398*** | -2.636*** | -2.385*** | -1.894*** | -2.159*** | -1.967*** |
| 1995 time dummy | -2.444*** | -2.564*** | -2.437*** | -1.787*** | -2.121*** | -1.887*** |
| 1996 time dummy | -3.189*** | -3.289*** | -3.167*** | -2.479*** | -2.843*** | -2.589*** |
| 1997 time dummy | -3.178*** | -3.315*** | -3.166*** | -2.534*** | -2.861*** | -2.649*** |
| 1998 time dummy | -3.530*** | -3.633*** | -3.536*** | -2.825*** | -3.169*** | -2.956*** |
| 1999 time dummy | -4.197*** | -4.300*** | -4.223*** | -3.538*** | -3.848*** | -3.689*** |
| 2000 time dummy | -3.888*** | -3.998*** | -3.931*** | -3.826*** | -3.562*** | -3.448*** |
| 2001 time dummy | -3.846*** | -3.942*** | -3.881*** | -3.113*** | -3.447*** | -3.274*** |
| 2002 time dummy | -3.497*** | -3.556*** | -3.523*** | -2.689*** | -3.058*** | -2.848*** |
| 2003 time dummy | -2.940*** | -3.013*** | -2.972*** | -2.190*** | -2.513*** | -2.376*** |
| | | | | | | |
| $R^{\wedge 2}$ | 0.856 | 0.861 | 0.856 | 0.798 | 0.840 | 0.794 |
| Nº observations | 182 | 182 | 182 | 182 | 182 | 182 |
| Mean of dependent variable | 7.271 | 7.271 | 7.271 | 7.271 | 7.271 | 7.271 |

Notes: Dependent variable is the number of total marriages per year, divided by total population, by oblast.

* denotes 10% significance
** denotes 5% significance
*** denotes 1% significance

TABLE 5

DETERMINANTS OF CRUDE MARRIAGE RATES, KAZAKHSTAN 1994– 2003

| LEVELS ON LEVELS OLS REGRESSIONS I | (7) OLS | (8) OLS | (9) OLS | (10) OLS | (11) OLS |
|---|---|---|---|---|---|
| Constant | 3.777*** | 3.629*** | 3.005*** | 5.939*** | 6.342*** |
| Share of total population aged 20-29 years x100 | | | | | |
| Share of total population aged 20-24 years x100 | | | 41.526*** | | |
| Ethnic Kazakh share of total population x100 | 2.156*** | 2.156*** | | | |
| Net external migration/100,000 population | | | | | |
| Urban share of total population x100 | 0.967** | | | | |
| Housing construction ($m^2$)/100,000 population | 0.157*** | 0.091*** | 0.246*** | 0.211*** | |
| Employed population as % of economically active population (EAP) | | | | | |
| Self-employment as % of EAP | | | | | |
| Hired employment as % of EAP x100 | 1.301 | 2.044** | | 0.952 | 0.107 |
| Industrial share of GDP x100 | 0.726* | 0.992** | 1.453*** | 1.041** | 1.104** |
| Private automobiles/100,000 population | 0.741** | 0.757** | -0.245 | -0.665*** | |
| Average real wage, 000 KZT | 0.005 | 0.052 | 0.199*** | 0.228*** | 0.370*** |
| | | | | | |
| | | | | | |
| | | | | | |
| 1995 time dummy | 0.138 | 0.171 | 0.062 | 0.188 | -0.024 |
| 1996 time dummy | -0.483** | -0.387* | -0.642*** | -0.412 | -0.742*** |
| 1997 time dummy | -0.351 | -0.204 | -0.713*** | -0.352 | -0.772** |
| 1998 time dummy | -0.604* | -0.450 | -1.023*** | -0.577 | -1.091*** |
| 1999 time dummy | -1.161** | -0.984** | -1.787*** | -1.222*** | -1.840*** |
| 2000 time dummy | -0.857** | -0.710* | -1.558*** | -0.962** | -1.571*** |
| 2001 time dummy | -0.841** | -0.709* | -1.468*** | -0.958** | -1.584*** |
| 2002 time dummy | -0.549 | -0.442 | -1.116*** | -0.687 | -1.306*** |
| 2003 time dummy | 0.015 | 0.132 | -0.624*** | -0.116 | -0.702* |
| | | | | | |
| $R^{\wedge 2}$ | .738 | .728 | .666 | .633 | .589 |
| Nº observations | 140 | 140 | 140 | 140 | 140 |
| Mean of dependent variable | 6.716 | 6.716 | 6.716 | 6.716 | 6.716 |

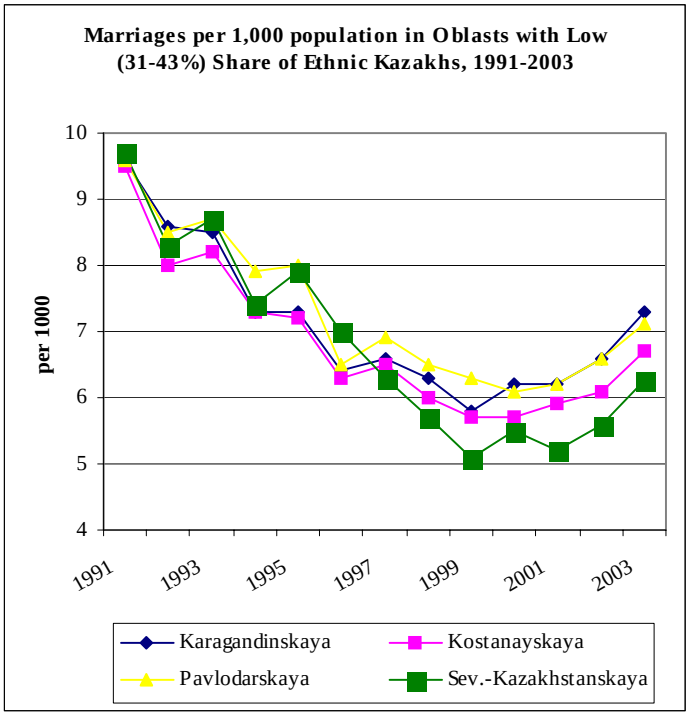
Notes: Dependent variable is the number of total marriages per year, divided by total population, by oblast.

* denotes 10% significance
** denotes 5% significance
*** denotes 1% significance

| Table 6: Probability of Being Married, Women aged 50-64, and TFFMR, Kazakhstan 1990-2035 | | |
|---|---|---|
| Year | No recovery scenario | Recovery scenario |
| 2020 | 41.04 | 62.12 |
| 2025 | 41.04 | 62.12 |
| 2030 | 32.89 | 59.80 |
| 2035 | 25.82 | 57.73 |
| | | |
| 2000 stable coefficients | 22.45 | 22.45 |
| 1990 stable coefficients | 46.54 | 46.54 |
| TFFMR | 62.23 | 103.43 |

Sources: Goskomstat RK, 2001; Goskomstat SSSR, 1990.

Recovery scenario: (a) 2005 age-specific marriage rate recovery to 1990 levels, but with 2.5 year increase in age at which each rate applies; (b) decline in male mortality to 1990 levels by 2005; (c) decline in effective divorce rate by 1/3.



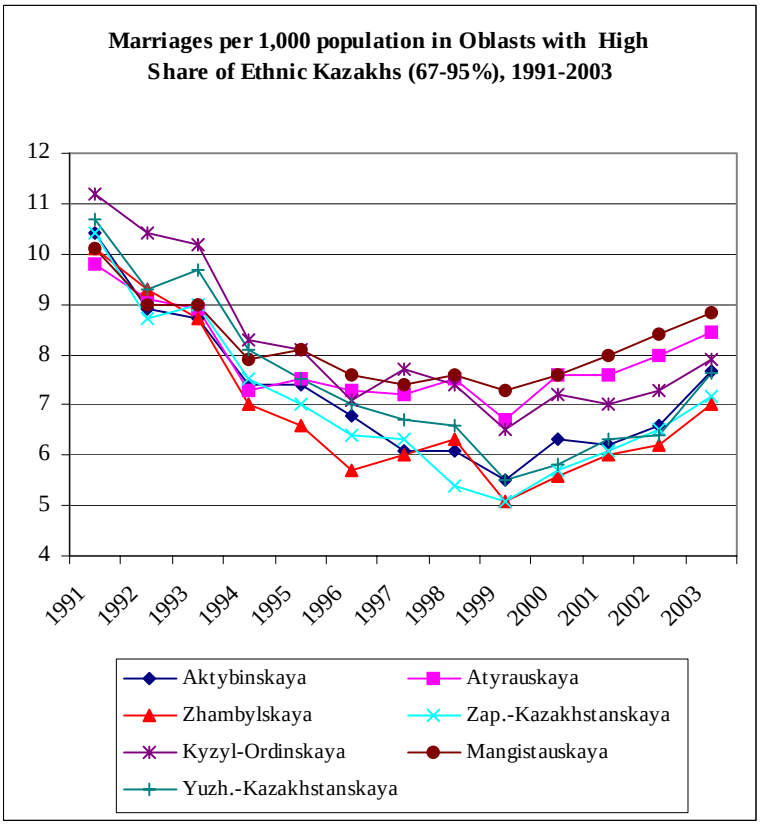
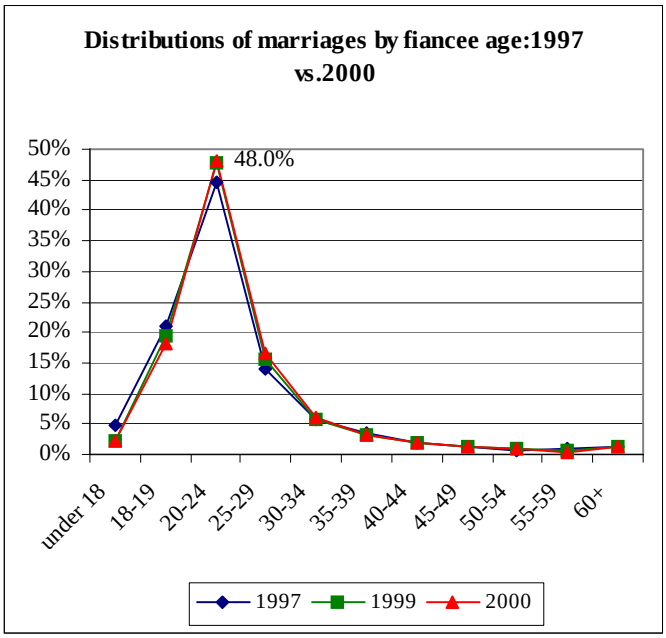




Figure 1: Crude Marriage Rates in Regions with High and Low % Kazakh Ethnicity, 1991-2003

Figure 2 Distribution of marriages by fiancée age, Kazakhstan 1997 and 2000



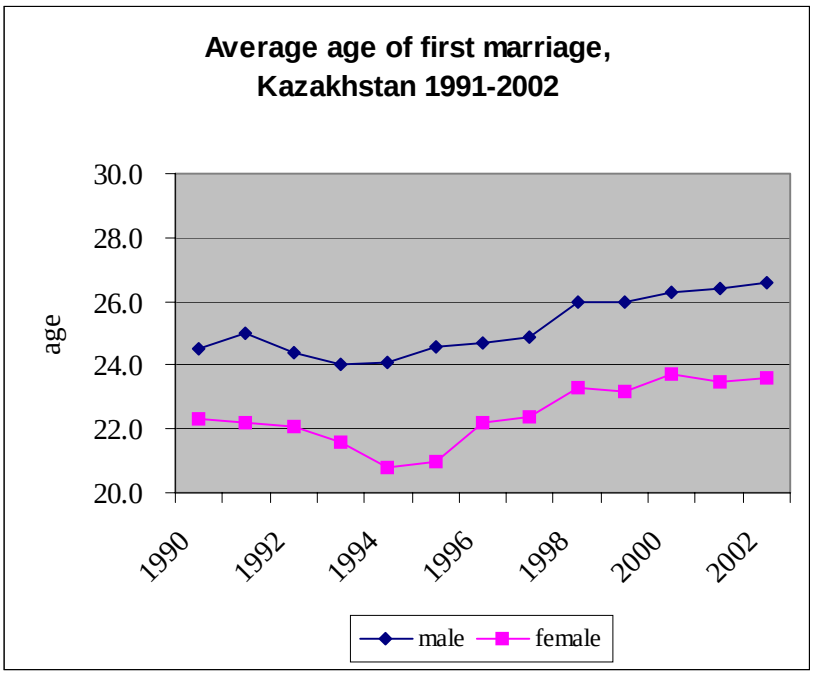




Figure 3 Average Age of First Marriage, Kazakhstan 1991 – 2002

Figure 4 Total Fertility Rate, Kazakhstan 1958-2003

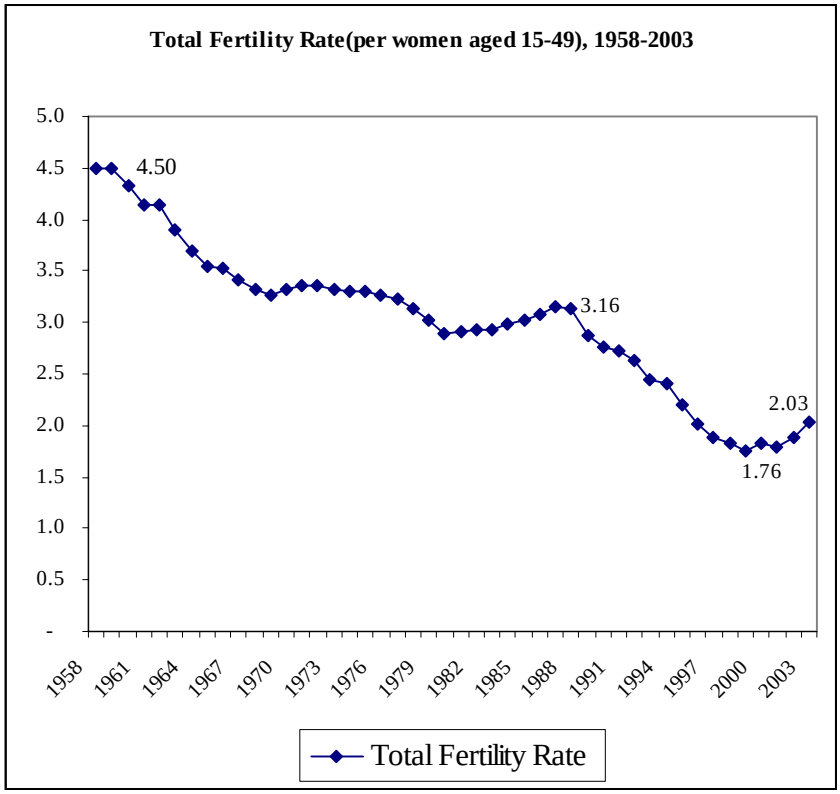


Figure 5 Age-specific birth rates, 1991-2003

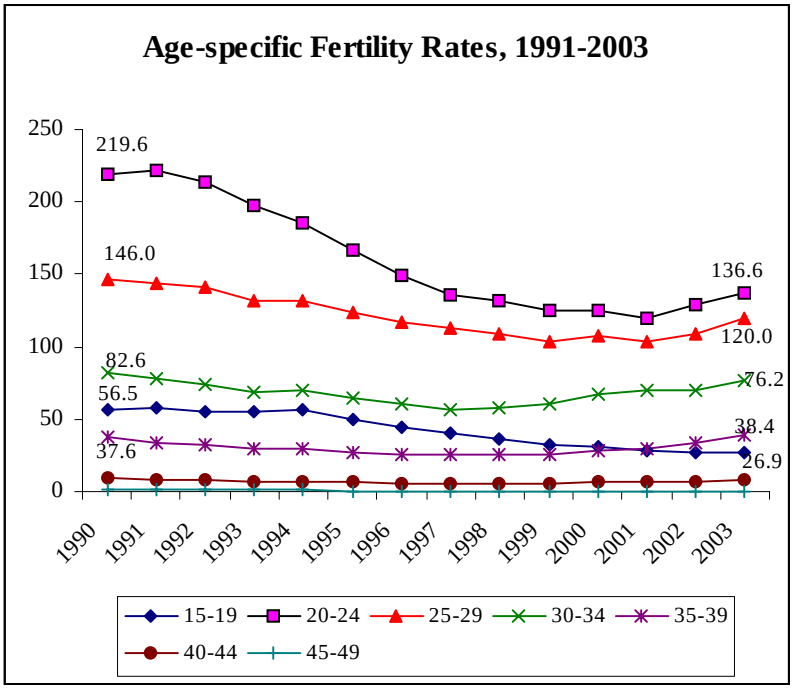



Figure 6 Age-specific fertility, urban vs. rural areas, Kazakhstan 2003

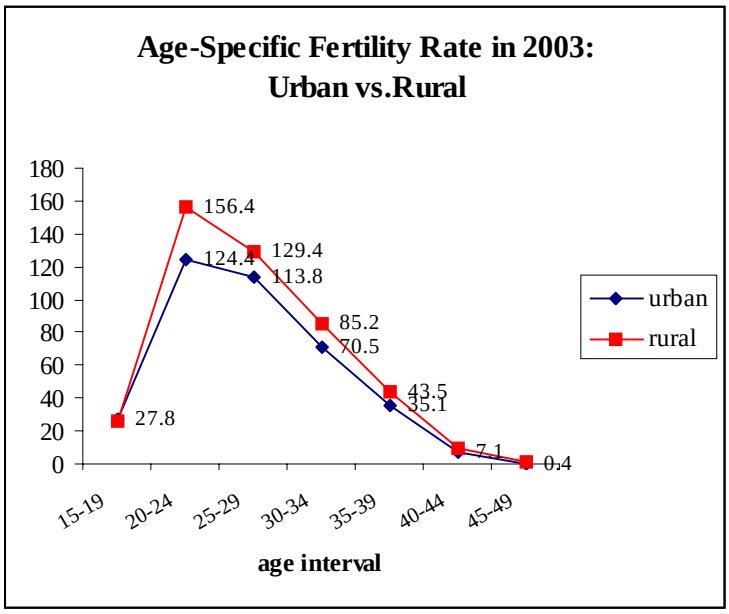
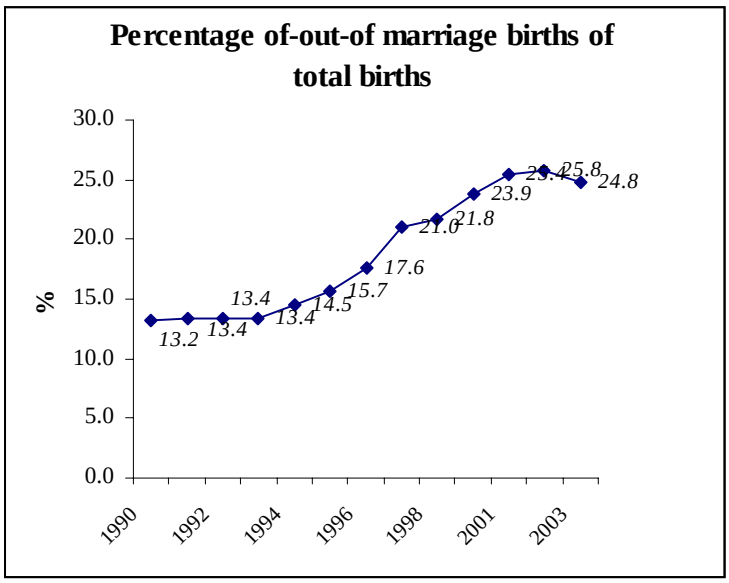


Figure 7 Non-marital births as a share ot all births, Kazakhstan 1990-2003



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