



THE WILLIAM DAVIDSON INSTITUTE  
AT THE UNIVERSITY OF MICHIGAN BUSINESS SCHOOL

*Channels of Redistribution:  
Inequality and Poverty in the  
Russian Transition*

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Working Paper Number 42  
May 1997

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Presented by Simon Commander in June 1997 at the *Davidson Institute Research Workshop on the Economics of Transition*. Disseminated by the William Davidson Institute with permission of the authors.



**Channels of Redistribution:  
Inequality and Poverty in the Russian Transition**

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The World Bank**

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<sup>1</sup> We thank Svetlana Misikhina for superb research assistance.



## Introduction

Among the many popular images of the Russian transition, none cast a more dramatic shadow than the apparently rapid transformation of an entire system from one characterised by low inequality and largely absent poverty to one marked by extremes of deprivation and prosperity. Once hailed as a salutary contrast to the extremes of well-being so characteristic of many economies at comparable levels of income, Russia now exhibits the tell-tale inequities that mark, for example, many Latin American economies. How accurate is this representation, both in its depiction of the situation pre-transition, let alone the consequences of recent changes? This paper is an attempt to answer these questions in as precise a manner as possible.

The picture that emerges qualifies the popular view quite substantially. Not only was the former Soviet Union a place in which inequality was certainly no stranger and where poverty was far from banished, but these features -- including large inequality across regions -- were sharply accentuated in the last, tumultuous years of the old regime as inflation, botched price reforms and piecemeal liberalisation unleashed a set of forces powerfully contributing to inequality. In short, by 1991 the FSU and Russia as a part, was already a country of substantial inequality with a high incidence of poverty.

The years of transition that have followed have seen dramatic changes in most conventional indicators. As *Table 1* indicates, not only have output, consumption and wages declined substantially but unemployment -- as measured by labour force survey -- has risen quite significantly. Further, national accounts data -- almost incredibly -- indicate a collapse in the labour share of income from 44 percent in 1991 to around a third by 1996. Of course, these aggregates disguise considerable heterogeneity, as sectors rise and fall consistent with restructuring, and hence the distributional consequences are far from obvious. Nevertheless, as we will demonstrate, the transition years have undoubtedly compounded the initial inequality, as the forces associated with



**Table 1: Russia, Basic Indicators, 1992-1996**

	1992	1993	1994	1995	1996
GDP growth	-18.5	-12.0	-15.0	-4.3	-6.0
Total consumption	0.8	-8.2	-9.5	-2.5	-3.0
Inflation (annual)	1354	895	303	189	48
Fiscal Deficit	-18.9	-7.6	-10.1	-6.1	-8.5
Social Spending	10.1	9.3	10.0	8.3	10.2
Subsidies	32.8	13.0	10.9	6.7	n.a.
Subsidies to households	2.1	4.1	4.9	3.9	n.a.
Unemployment	4.9	5.5	7.4	8.2	9.6
Average wage	-29.0	5.8	-16.3	-23.7	13.0
Average pension	-64.0	38.8	18.0	-11.0	-2.0

Note: GDP, Consumption, Wage and Pension information are annual real changes. The fiscal deficit, social spending, subsidies and subsidies to households are expressed as a share of GDP. The unemployment numbers are from the Labour Force Survey

Sources: Goskomstat, World Bank and IMF

**Table 2: Russia and the Soviet Union; Estimates of Inequality and Poverty, 1980-1991**

	-----Gini-----		--Decile Ratio-		-Headcount-
	Russia	USSR	Russia	USSR	Russia
1980		0.24-0.29		3.25	
1985		0.26-0.28		3.30	
1988	0.26-0.28	0.29	3.32	3.53	
1990	0.26-0.27		2.99		5.1
1991	0.26-0.27		3.24-5.40		9.9

Sources: Goskomstat, various publications; Alexeev and Gaddy (1993); Doyle (1996); Atkinson and Micklewright (1992)

transition -- the elimination of price controls, the emergence of a private sector, asset transfer and liberalisation of wage setting -- have generally acted in favour of greater rather than less inequality. In short, the popular image of a growing inequality is confirmed.

There are, however, some important qualifications. The emerging system remains far from stable; the disintegration of the old system is far from complete and with it the consolidation of new classes has yet to be fixed. Similarly, the share of the population at any time experiencing poverty has fluctuated substantially and, if anything, has tended to decline since the start of transition. The evidence suggests that stabilisation has indeed been associated with a decline in the incidence of poverty. But that is not sufficient to make our story a happy or even desirable one. The Russian transition is generating a system of much inequality; there are clearly groups in the population who suffer from chronic poverty and the political economy implications of both the changes in asset and income distribution are yet to be fully appreciated.

The paper is organised as follows. Section 1 gives a brief description of the datasets -- primarily the six rounds of a large household survey, the Russian Longitudinal Monitoring Survey (RLMS) -- that we use in this paper. Section 2 sets out the initial conditions that obtained in the Former Soviet Union and Russia and the picture that emerges from use of official statistics. These are shown to be seriously misleading in a number of key respects. Section 3 deals with the channels of redistribution that are likely to be present in the transition and surveys the evidence available from both aggregate data and firm-level information. In Section 4 the key channels are formalised in a two sector model of transition in which the reallocation of labour and capital across state and private sectors is seen as the determining feature of transition. The model is primarily concerned with labour allocation and hence can provide the paths of inequality and poverty over the transition primarily associated with labour income. Some simulations are presented which provide a set of simple benchmarks for understanding the size of likely effects from both



within-sector inequality as also through restructuring and closure probabilities for state firms and the relative productivity of both state and private sectors. Section 5 turns to the empirical findings that emerge from a detailed look at the household surveys, including the factors driving the changes in inequality. Section 6 looks at how stable the transitions over the income distribution have been and, in particular, takes a closer look at groups of stable winners and losers. Section 7 turns to the measurement of poverty and the results that emerge from the household survey regarding both expenditure and income measured poverty. We also look at the characteristics of the poor. Section 8 concludes.

## **1. Data**

The results reported in this paper are for the most part derived from a very rich source of information on Russian households, the Russian Longitudinal Monitoring Survey (RLMS). The survey has collected very detailed information from households on expenditure and income patterns, initially in 21 regions of Russia and subsequently in 38 regions. It has been administered to between 3800-6200 households at regular intervals since the start of transition in 1992. A fuller description of the sampling procedure and coverage can be found in Popkin et al (1992). We use information from the first six rounds of the survey. The first round was administered between July and August 1992, the second between December 1992 and February 1993, the third in May-June 1993, the fourth in October-November 1993, the fifth in November 1994 and the sixth in October-November 1995. Because of major changes in the sampling frame -- including reduction in the size of the overall sample and expansion in the regional coverage -- we have had to create two panels. The first utilises information from the first four rounds when sampling was broadly comparable. The second panel takes information from rounds 5-6. In both instances, we work with a balanced panel of households which, after suitable cleaning, gives us around 5600 observations for rounds 1-4 and just under 3300 observations for rounds 5-6.

The survey contains detailed information on both incomes and expenditures at household and individual level. In this paper, we largely rely on the household-level information. Households are defined as a set of persons with the same residence and a common budget. Household income includes all earnings, transfers and capital income. It also includes some in-kind income with imputed values. It does not however include imputed rents. The expenditure data include all purchases of goods and services as well as in-kind items. Our results are reported using real values based to June 1992 and disaggregated to the region level using regional price deflators. This is important because of the significant variation in price levels across regions in Russia; a variation that makes use of either nominal values or those deflated using the aggregate consumer price index likely to be misleading.

## **2. The Initial Conditions**

Understanding the degree of inequality and poverty present in pre-1992 Russia is complicated by the fact that official data were primarily intended to represent income trends and changes in the structure of expenditure; not inequality per se. Indeed, official estimates of monetary incomes, disaggregated by region, were put together from a disparate set of sources, including monetary aggregates. Moreover, a major share of household income came from in-kind compensation, whether channeled through the enterprise or government. In addition, pervasive shortages of goods and differential access to goods across the population -- both ignored in official measures -- had significant implications for inequality.

Official surveys contained two clear sources of bias which both led to under-estimation of inequality and poverty. The first bias can be traced back to the sampling frame for the major source -- the Family Budget Survey (FBS) -- used by the statistical agency, while the second and associated source of bias lay with the under-measurement of official or illegal activity. In the case of the FBS, sampling was concentrated among households employed in the state sector and in collective farms an under-represented private or

cooperative activity, as well as pensioners. As greater private activity was tolerated in the 1980s, under-estimation of inequality likely increased over time. These measurement problems have generally persisted into the recent period, requiring much caution in the use and interpretation of official data <sup>2</sup>.

With these major caveats in mind, *Table 2* pulls together a range of estimates for inequality and official estimates of the poverty headcount in the last years of the Soviet Union. Both the decile ratio and the Gini coefficients for Russia indicate rather more inequality than in Central Europe but, all told, significantly less inequality than in the OECD economies. The Gini estimates - - ranging from 0.26-0.28 at the end of the Soviet period -- show no trend through the 1980s which is surprising considering the growth in cooperatives and in the unofficial economy. Note that these estimates are for per capita values which, given pervasive subsidies to households for housing and fuel -- subsidies that have continued largely intact through the period covered by this paper -- may not be seriously distorting <sup>3</sup>. It is also interesting to note that when comparing the overall distribution of income to that for earnings, the Gini coefficient in the Soviet period was actually slightly lower for the latter <sup>4</sup>; a clear difference with most market economies.

*Table 2* also tells the beginnings of a story on poverty. There are no available sources for calculating a headcount or other measure pre-1989 <sup>5</sup>. Even then, the official headcount measures reported in *Table 2* are based again on the FBS and largely ignore non-working households. However, this likely source of under-estimation was, to some extent, offset by the manner in which the subsistence minimum -- the proxy for the poverty line -- was calculated. By excluding economies of scale in household consumption, the minimum

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<sup>2</sup> For example, income data for 1992 relate to total incomes; thereafter only estimates of monetary income have been used. It is also unclear what deflators (if any) have been used by Goskomstat to get real values.

<sup>3</sup> Atkinson and Micklewright (1992) point out that such subsidies would tend to reduce households' fixed costs and hence ignoring scale economies may not matter that much.

<sup>4</sup> Atkinson and Micklewright (1992), p122.

<sup>5</sup> There were, of course, a range of estimates made by non-Soviet analysts. McAuley (1979), for example, argued that in 1967-68 between 35-40 percent of the Soviet population fell below the poverty line.

income level was set high leading to over-estimation of poverty <sup>6</sup>. It should also be noted that variation in region price levels appears to have been neglected; an important omission even in the late Soviet period as high inflation and high variance across regions emerged. These numbers -- with all their problems -- indicate a small share of the Russian population in poverty -- around 5 percent -- at the end of the 1980s, with, however a doubling in 1991 and a dramatic increase in early 1992. At that point over a quarter of the population had monthly incomes below the poverty line.

### **3. Channels of redistribution**

#### **An Overview**

The transition has been associated with a variety of channels -- explicit and implicit -- for redistributing both income and wealth. As usual, the net effect of these dynamic processes is difficult to identify. *Table 3* provides a starting point. These are official estimates of the change in the income distribution between 1992 and 1995. In that period, the Gini apparently rose by nearly a third and the decile ratio jumped from 8 to 13.5. These estimates also show that the main gainer in this process has consistently been the top quintile with all other quintiles losing income share. As we shall see, these estimates are questionable. But before going in more detail into measurement, at this stage it may be useful to provide a simple listing of the factors specific to transition likely to drive shifts in the distribution of income and wealth. We now look briefly at the aggregate information that is available to us to get a better sense of the respective evolutions. Later -- in Section 5 -- we try and track down, within the constraints provided by our dataset, the relative weights of these factors in driving distributional changes.

#### **3.1 Asset transfer and the growth of a private sector**

The most visible of these channels has been the large-scale transfer of previously publicly owned assets into the hands of private agents. Getting any

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<sup>6</sup> For a fuller discussion of these measurement issues, see World Bank (1994), Volume 1.

**Table 3: Official Estimates of Inequality in Russia, 1992-1995**

	Gini	Decile Ratio	-----Quintile Shares-----				
			1	2	3	4	5
1992	0.29	8.0	6.0	11.6	17.6	26.5	38.3
1993	0.40	11.2	5.8	11.1	16.7	24.8	41.6
1994	0.41	15.1	5.3	10.2	15.2	23.0	46.3
1995	0.38	13.5	5.5	10.2	15.0	22.4	46.9

Note: Quintile shares are calculated with total incomes for 1992; monetary incomes for later years

Source: Goskomstat

**Table 4: Wage variation in Russian manufacturing, 1990 and 1994**

	-----1990---		-----1994-----				
	Gini	D.R.	Gini	D.R.	State	Privatised	New
All	0.22	2.1	0.32	4.9	0.30	0.32	0.34
Blue collar	0.22		0.34		0.31	0.40	0.33
White collar	0.26		0.35		0.34	0.36	0.35
Managers	0.26		0.32		0.32	0.34	0.34

Note: D.R.=Decile Ratio

Source: World Bank Survey of Russian Enterprises. See Commander, Fan and Schaffer (1996)

precise handle on the scale of transfer is almost impossible, given the variety of mechanisms -- legal and illegal -- by which such transfers have occurred, as well as other statistical shortcomings <sup>7</sup>. Very approximately, it appears that by 1995/96 over 60 percent of firms were in the private sector, with roughly comparable shares of private in total employment and output. Part of this growth occurred because of voucher privatisation -- approximately half of private sector employment was in firms that had been privatized legally -- but also by growth in new firms, including extensive sub-divisioning of existing firms <sup>8</sup>. In addition, significant privatisation of housing has occurred. By early 1996 nearly 50 percent of the housing stock was in private hands.

The structure of share ownership that has emerged from privatisation is still largely clouded in mystery. Crude estimates suggest that roughly half the equity in privatised firms remains controlled by insiders, roughly a third by outsiders -- including banks -- and the remainder has stayed in public hands. Anecdotal evidence suggests greater concentration over time in share holding in privatised firms, either through resale or through additional share offerings. In short, whatever the exact process, there is no doubt that there has been a truly large transfer of assets to the private sector.

### **3.2 Changes in government expenditure and taxation**

A second channel involves the evolution of public expenditures, particularly in terms of social protection. The changes are difficult to pin down with any exactitude, as the Soviet system of social protection combined a reasonably extensive system of cash transfers with a substantial system of in-kind transfers delivered by a combination of enterprises and government agencies. However, coverage was far from complete and the absence of complete indexation led to major erosion or lags in benefit values from 1991

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<sup>7</sup> For example, no meaningful figures exist on the value of the assets that have been privatised. Further, legal privatisations accounted for no more than 122,000 cases out of more than 2 million legal entities. But the massive growth in 'new' firms -- over 1 million between 1994-96 -- camouflages a variety of developments, including widespread sub-divisioning of existing firms.

onwards. The pre-transition system of transfers was not targeted and largely took the form of a per capita distribution. The overall effect of cash transfers was at best to induce a minor reduction in inequality <sup>9</sup>.

Since 1992, cash transfers -- covering pensions, unemployment benefits, social insurance and assistance for vulnerable groups -- have actually tended to increase as a share of GDP -- from c 6.5 percent in 1990 to around 10 percent between 1994 and 1996 -- and as a share of government spending. But aggregate government spending declined dramatically in the same period, implying a fall of around 30 percent in real expenditure on social protection between 1992 and 1996. This decline in government social spending has been compounded by the reduction in social spending by firms. There are also indications that firms have begun to cut back on the provision of non-monetary benefits to workers, but the pace of reduction has remained quite gradual.

The largest transfer programme has been for pensions and here the decline in benefits has been most visible <sup>10</sup>. With incomplete indexation, pensions have been poorly protected in real terms. By 1996 the average pension was just over half its value in 1992 and, as we shall see in Section 8, this has resulted in a significant share of pensioners being mired in poverty or its proximity.

However, the overall picture is made more complex by the growing importance of local governments in social expenditures and in the provision of subsidies to both firms and households. Here, there appears to have been a clear expansion in the size of transfers. Subsidies from local governments to firms exceeded 4 percent of GDP in 1993 and 1994, with over 70 percent of those subsidies directed to public utilities and maintenance of the housing stock. Subsidies from sub-national budgets to households similarly rose from

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<sup>8</sup> Richter and Schaffer (1996).

<sup>9</sup> See also some consistent results for Ukraine in Kakwani (1994).

<sup>10</sup> Russian pension expenditures have remained low by international standards -- accounting for under 3 percent of GDP -- and with average replacement rates around 35 percent. The

just over 2 percent of GDP in 1992 to between 4-5 percent in 1994/95, implying an increase of about 40 percent in real terms by 1995 <sup>11</sup>. In sum, subsidies to households from sub-national budgets have increased substantially. They have not been targeted -- a recent estimate suggests that roughly 20 percent of poor households received no public transfers whatsoever <sup>12</sup>-- and have largely taken the form of housing and household energy transfers. Housing allocation has generally had a progressive effect on the income distribution. Buckley and Gurenko (1997) estimate that when the imputed value of housing is added to household income, inequality is unequivocally reduced <sup>13</sup>.

Finally, in terms of taxation, the Soviet system was explicitly progressive. Declining tax compliance -- both by enterprises and the higher end of the income distribution -- would likely have had the effect of increasing inequality. Similarly, the shifts to more regressive taxation instruments -- such as the value added tax -- are likely to have had some effect, but of what magnitude is yet unclear. Unfortunately, the household survey data that we use in this paper has little usable information on taxation and its incidence.

### 3.3 Changes in wage setting

Earnings inequality in the Soviet Union by the mid-1980s was significantly larger than in most Central European countries and roughly comparable to the situation in the UK <sup>14</sup>. The Gini for earnings at that time was 0.28 and the decile ratio was 3.3. Wage dispersion was guided by a variety of factors; the use of incentive schemes to attract workers to outlying regions as well as a wage tariff system that in part reflected ideological

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Pension Fund is precariously placed given the growth in recipients and the decline in the financing base.

<sup>11</sup> We thank Lev Freinkman for providing these numbers and for some illuminating discussions.

<sup>12</sup> Klugman (1997).

<sup>13</sup> Their estimates are based on an imputed 20 percent median value for rent with some correction for space. With this value, they calculate -- using the RLMS Round 1 data -- that the Gini would decline by as much as 6 percentage points. However, these estimates are far from precise.



preferences. Among other consequences, this severely distorted returns to education. However, these inequality indicators were generated without taking into account differences in regional price levels and, moreover, ignored non-monetary components of total compensation. The latter were a significant share of total compensation, particularly in manufacturing. A recent estimate -- from a large sample of nearly 450 Russian manufacturing firms -- indicates that by 1994 the share of non-monetary benefits in total compensation was around 16 percent. This share would, if anything, have been higher in the Soviet period <sup>15</sup>.

Transition has changed wage setting in a number of key respects. The tariff wage structure and the system of regional coefficients has basically collapsed. Firms were largely left to determine their own wage bargains. There is some evidence that the non-monetary components of compensation have been declining, though subsidies to housing and energy remain important. And new private firms tend to offer lower non-monetary benefits. Survey evidence indicates that earnings dispersion has increased significantly. *Table 4* shows that between 1990 and 1994 the Gini on wages for all employees moved from 0.22 to 0.32 and the decile ratio went from 2.1 to 4.9; a very large change indeed. For 1994 where we have the value of total compensation -- including firm-provided benefits -- the effect is to raise inequality; the Gini shifts to 0.34 as against 0.32 for wages alone. The main source of variation comes from differences in benefits provision across firms rather than from different access within firms. We should also note that these changes appear to be fairly common across the skill categories that are available. However, mean wages for managers were significantly higher (>50 percent) than for either white or blue collar workers in 1994 compared to 1990.

In thinking about wage determination, while new private firms can be assumed to set wages competitively, both the remaining state and privatised

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<sup>14</sup> Atkinson and Micklewright (1992).

<sup>15</sup> Interestingly, estimates from Ukrainian firms -- subject to less pressure for reform -- in 1994 and 1995 put the share in the range of 22-26 percent of compensation. See Commander and Schankerman (1997).

firms can, perhaps most realistically, be assumed to have some rent sharing with wages set in the interval between average and marginal product. In state firms a simple assumption would be that wages are set equal to average product <sup>16</sup>. Enterprise survey evidence indicates that *de novo* private wages tend at a minimum to be higher by around 20 percent as compared to either state or privatised firms. But this relates to monetary compensation and an appropriate measure of total compensation -- including in-kind benefits -- appears to narrow the compensation gap <sup>17</sup>. This is likely to be an important factor behind workers remaining in state or privatised firms.

In sum, the ultimate implications for the earnings distribution are complex, depending not only on within-sector inequality but also the net effect of rent sharing, given that the appropriation rule will affect the relative values of different labour market states as well as the hiring rate into the private sector. *Table 4* indicates that both privatisation and *de novo* status tend to be associated with greater dispersion. We return to this more formally below.

### 3.4 Restructuring and unemployment

Central to transition is the closure and restructuring of firms as resources are reallocated. Decisions on restructuring will depend on the relative values of the various labour market states. Most generally, however, restructuring should raise the long run value of the firm, but the process will also necessarily imply job losses and unemployment. It may also involve non-trivial adjustment to hours worked. In Russia wage and hours variation has tended to dominate adjustment to employment. *Table 1* has also shown a clear upward drift in unemployment as measured by labour force surveys. By 1996 unemployment exceeded 9 percent. So while aggregate payments to the unemployed have obviously increased over time, partial coverage and low generosity -- the replacement ratio has not exceeded 15 percent -- have held

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<sup>16</sup> See Blanchard (1997) for an extended discussion of wage setting in the state sector.

<sup>17</sup> See Commander, Fan and Schaffer (1996) and Commander and Schankerman (1997).

expenditures down to under half a percent of GDP. While unemployment will have tended to open up the income gap with those in work, small variation in benefits across the unemployed would also tend to dampen inequality.

### **3.5 Price liberalisation and inflation**

Transition has been associated with a loosening of controls on prices. But in both the scale and pace of liberalisation there has been wide regional variation and certain prices -- particularly for housing -- have remained largely administratively determined. Nevertheless, food prices and other items likely to figure prominently in the consumption basket of the poorer groups have largely been determined by market factors rather than administratively. Further, unlike the major Central European countries, Russia has not managed a rapid stabilisation. Annual inflation only dropped below the 50 percent threshold in 1996. There has been little evidence of indexation, resulting in large short-run variations in the major components of income. This has been accentuated by the growing presence of wage arrears and other payment lags.

Experience from other high inflation episodes points to strong redistributive effects, mainly at the expense of the poor. And aggregate data indeed indicate that the inflation tax in Russia appears to have had a powerful effect. In 1992, for example, it has been estimated that households were hardest hit by inflation, losing about 12 percent of GDP through this tax on financial assets. This amounted to roughly a quarter of household income and

is likely to have been regressive, given the ability of richer households to shift into real assets or indexed-linked financial assets <sup>18</sup>.

Aggregate data indicate that after 1992 household financial assets in the banking system have tended to decline further relative to income. In addition and predictably, households shifted into dollar and other non-rouble holdings. Unfortunately, the RLMS dataset has very inadequate coverage on households financial assets. This makes a direct look at the size of the inflation tax problematic.

Nevertheless, we can look at whether higher inflation and greater volatility at the level of the region are associated with higher inequality or a worsening in inequality -- as measured by the Gini on income, we pooled the data by region. Our results indicate that in both level and change specifications, more region inflation appears to be associated with higher inequality or an increase in inequality, but the effect is neither large nor significant. The volatility term generally enters with a positive sign but is also quite insignificant <sup>19</sup>.

But turning to the effects of inflation on non-indexed sources of income -- particularly wages and pensions -- we find that there is a clear and significant inverse relationship at region level between inflation and the share of either pensions or wages in total income <sup>20</sup>. While the result is far from conclusive, it suggests that, regions with higher and more volatile inflation tend to have experienced a greater decline in the shares of wages and pensions in total income over time.

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<sup>18</sup> Easterly and Vieira da Cunha (1994).

<sup>19</sup> In the level regression the region Gini was regressed against a constant; average inflation in that region and the standard deviation of inflation. The percentage change in the Gini across rounds 1-4 and rounds 1-6 were also regressed against the percentage change in inflation and the standard deviation.

<sup>20</sup> Using data for 14 regions over 6 rounds, we regressed either the wage or pension share against the lagged value, region inflation and its standard deviation and a constant. In both regressions, the inflation term was negative and significant. The volatility term switched signs and was not significant in either regression.

#### 4. Inequality and Poverty in a Model of Transition

Having surveyed the likely channels by which changes in both the income and asset distribution are likely to have been affected in the transition, we now try and ground this discussion in order to isolate better the likely effects over the course of the transition. The model and associated simulations that we now present has a number of important limitations. The major failing is that it is essentially a model of labour reallocation in the transition and the allocation procedure for capital income is omitted, an approach in part dictated by the general lack of information with which to calibrate the model sensibly. This obviously by-passes a crucial feature of the transition. Even so, we believe that it provides -- under a set of consistent assumptions -- a benchmark for indicating the net effects on both inequality and poverty of the various channels.

The model is an extension of that in Commander and Tolstopiatenko (1997). *Appendix 1* provides the more detailed presentation. A summary of its main contours is given here as well as a more extended discussion of the extensions aimed at capturing the distributional effects. The economy consists of two sectors -- state and private -- and three basic labour market states; state employment, private employment and unemployment. At the start of transition virtually all employment is in the state sector. State firms are assumed to be less efficient in production than the private sector and, being dominated by insiders, are assumed to be governed by a zero profit constraint so that wages are set equal to average product. The private sector is profit maximising. In the base case, wages are assumed to be set competitively. Both hiring and investment occur only in the private sector.

State firms face changing constraints. For example, they must confront the possibility that they will close because, say, of the implementation of a bankruptcy law. So, insiders in state firms will be faced with a choice over whether to continue subject to some probability of closure or whether to choose to restructure. If they elect to restructure this will result in a decline of employment, an increase in marginal product for the remaining workers and a

change in wage setting with wages now set competitively as in the private sector. Restructuring obviously implies that some workers lose their jobs and go to unemployment and the restructuring decision will in part depend on the value of being unemployed, where that value is summarised by unemployment benefits. Benefits in turn are financed from payroll taxes levied on both state and private firms. These probabilities of closure and restructuring are endogenised and assumed to depend on the difference between the values of various states. The private sector will thus grow by hiring from the pool of unemployed but also because some state firms will restructure voluntarily.

In this framework, we can immediately isolate several discrete ways in which the transition -- summarised by the dynamic reallocation of resources from the state to the private sector -- can affect the income distribution. The first turns on the extent of inequality in wages within the two sectors and among the unemployed receiving benefits. We assume a lognormal distribution for the within sector distribution. The within sector values are imposed exogenously, drawing broadly on the empirical findings presented in this paper. Second, inequality across sectors will depend on the production functions that govern labour incomes in the sectors and hence on their respective productivities. The distribution of labour across each sector will in turn depend on a number of variables, including the probabilities of closure and restructuring and the level of unemployment benefits that determine jointly the values of the respective labour market states. Inequality will thus be determined by a combination of the dynamics of employment and labour incomes and also by within-sector values of inequality. To get to a measure of total inequality we rely on indices that are additive and decomposable -- principally the Theil log index and, with restrictions, the Gini measure <sup>21</sup>.

We also derive the implications for poverty in the transition. Our approach is quite straightforward. The poverty line is calibrated with respect to the value of unemployment benefits and labour incomes. This is the main

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<sup>21</sup> The Gini is retrieved by decomposing a density function into its three sector terms and then reintegrating with a lognormal form of density function.

factor influencing the number of poor. The aggregate headcount measure depends on the relative number of poor in each sector, determined by the position of labour income in the particular sector with respect to the poverty line and the coefficient of variation for income in each sector, weighted by employment in each sector. The dynamics of the headcount index are thus determined by the dynamics of employment and labour incomes and by our assumptions regarding income variation in each sector.

The ways in which inequality will be affected in the model are complex. Here we can highlight a number of the more important channels.

- The restructuring probability will obviously affect employment in the private sector. A higher probability will tend to lead to an increase in inequality primarily by raising employment and output in the private sector and hence the private sector wage.
- The net effect of a higher probability of closure will depend on the interaction of the increase in unemployment and the decline in the value of being in the private sector at the end of restructuring. While there is some ambiguity in the overall impact of raising the closure probability, the unemployment effect is likely to be stronger and inequality will rise with an increased probability.
- The unemployment benefits level obviously determines the value of being unemployed. An increase will tend to raise unemployment but this will generally contribute to a decline in inequality because of lower within and between variation in labour income.
- If wages are not determined competitively in the private sector and there is rent appropriation, this will tend to increase inequality.
- An increase in the discount rate will raise the value of being unemployed relative to being in the state or private sector and hence the number of unemployed. Low within unemployment inequality will tend to reduce aggregate inequality.

With respect to poverty, the headcount obviously depends strongly on the relation between the poverty line and unemployment benefits.

- Raising benefits will tend to increase unemployment and in most plausible cases, the number of poor.
- An increase in the probability of restructuring leads to a decrease in the number of poor by tending to cut into unemployment and by increasing employment and wages in the private sector.
- A higher probability of closure tends to raise the headcount by pushing more into unemployment.
- If wages are not set competitively in the private sector, this will tend to reduce unemployment and hence poverty but the effect will be partly offset by the increase in the number of poor in the private sector due to high income variation in the private sector. If rent sharing is large, this can lead to an increase in the poverty headcount.
- An increase in the discount rate reduces the value of being in the state or private sector as compared with unemployment. This raises unemployment and with it the headcount. The total effect is quite ambiguous.

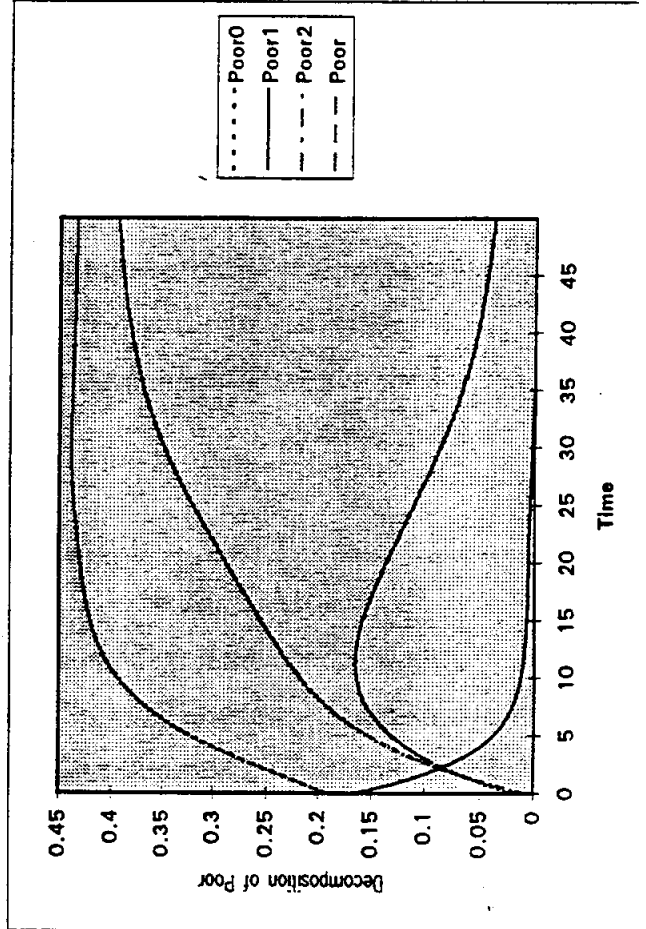
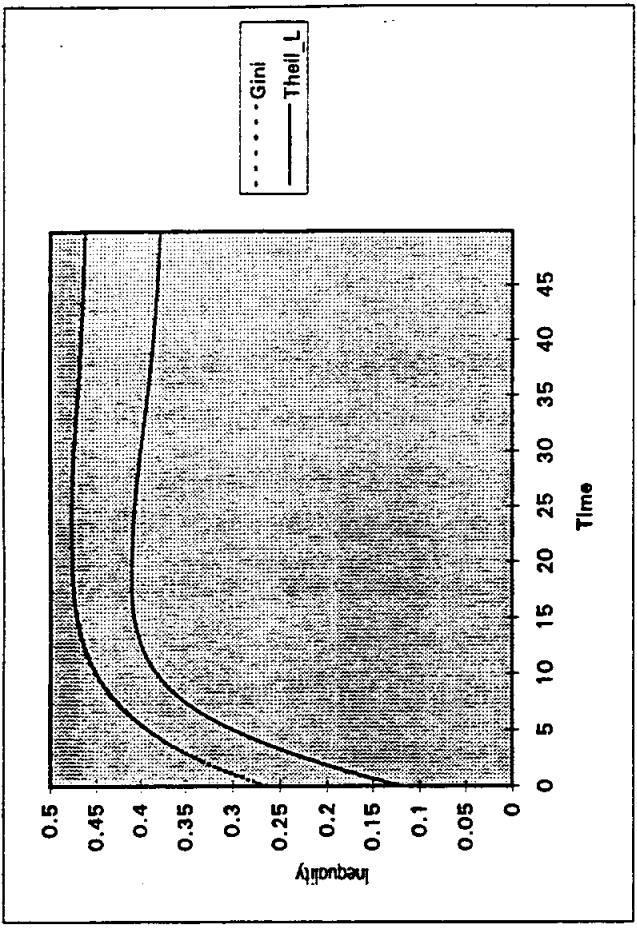
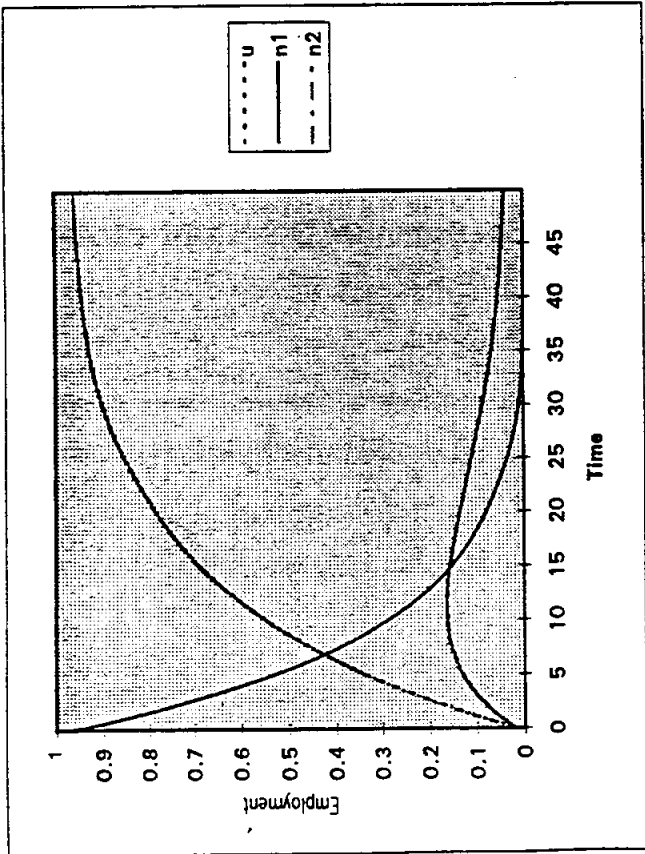
*Figure 1* present the baseline simulations. For calibration of some of the key variables, the following parameters were picked being based, to the extent possible, on available information regarding conditions in Russia. Unemployment benefits are initially set at 20 percent of average wages. This is slightly higher than the official replacement ratio in Russia but probably corresponds to actual rates after local adjustments. The poverty line is set with respect to benefits which, using the information presented in Section 7, gives a ratio of 3 for the poverty line to benefits. For within-sector inequality the coefficients of variation correspond to a Gini for the state sector of 0.25, for the private sector of 0.45 and for benefits recipients of 0.05. Wage setting in the private sector is assumed to be competitive. The initial values for closure and restructuring are each set quite low at 0.1.

We can see that with a very ungenerous benefits regime, low initial values for closure and restructuring and a poverty line significantly higher than benefits, unemployment remains quite low throughout the transition,



Figure 1

Parameters: Poverty Line/Benefits: 3.0; Benefits/Average wage=0.2



barely exceeding 15 percent. The reallocation of labour to the private sector is protracted. Inequality rises quite sharply to a maximum value for the Gini of around 0.47 before declining slightly. The poverty headcount more than doubles to over 0.4 and remains high throughout the transition.

*Figure 2* reports simulation with the same values, save that in this case the poverty line is set equal to benefits and the replacement ratio is set at 0.5; values closer to those, say, in Central Europe. In this case, unemployment peaks at around 20 percent and stays higher longer. Inequality similarly rises more gradually to reach a plateau of just over 0.4 for the Gini. While the increase in the headcount is large, the ascent is significantly less steep and the maximum value attained is just over 0.3.

The simulations reported above give, under plausible assumptions, some sense of the likely impact of the transition on inequality and poverty when concentrating on the evolution of labour incomes. The model ignores capital income; clearly an important omission. These could be expected to accentuate inequality.

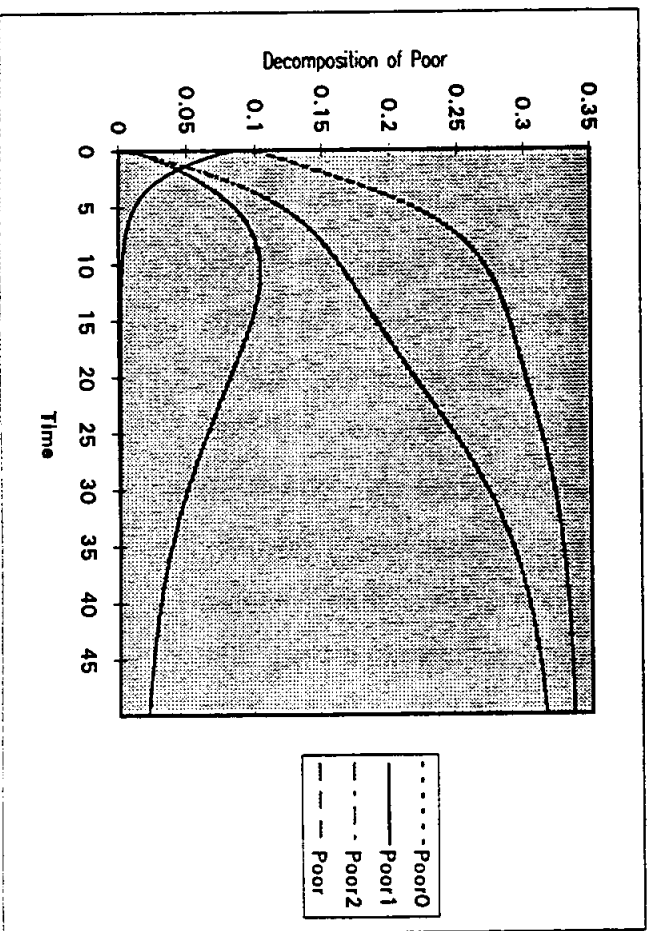
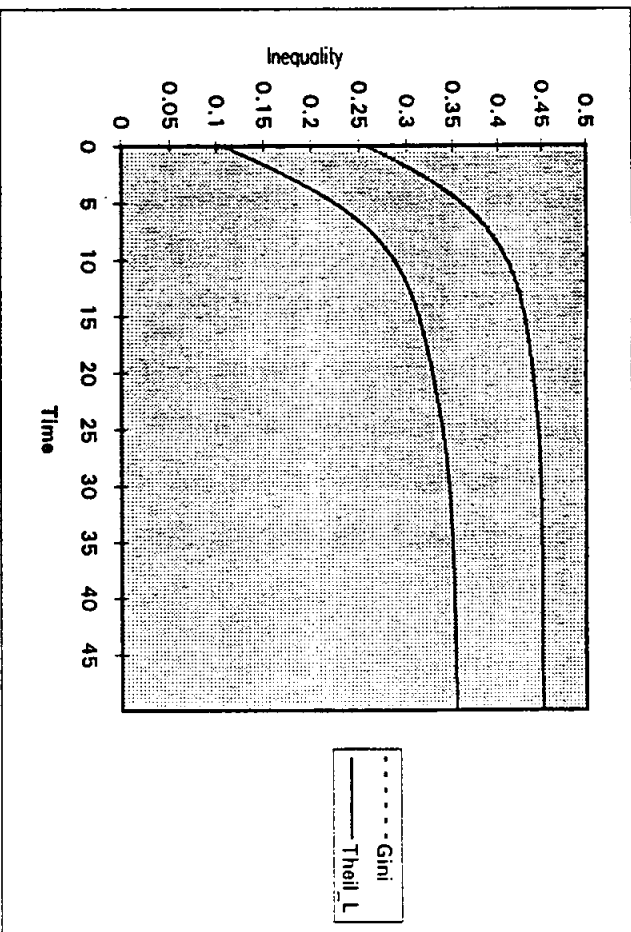
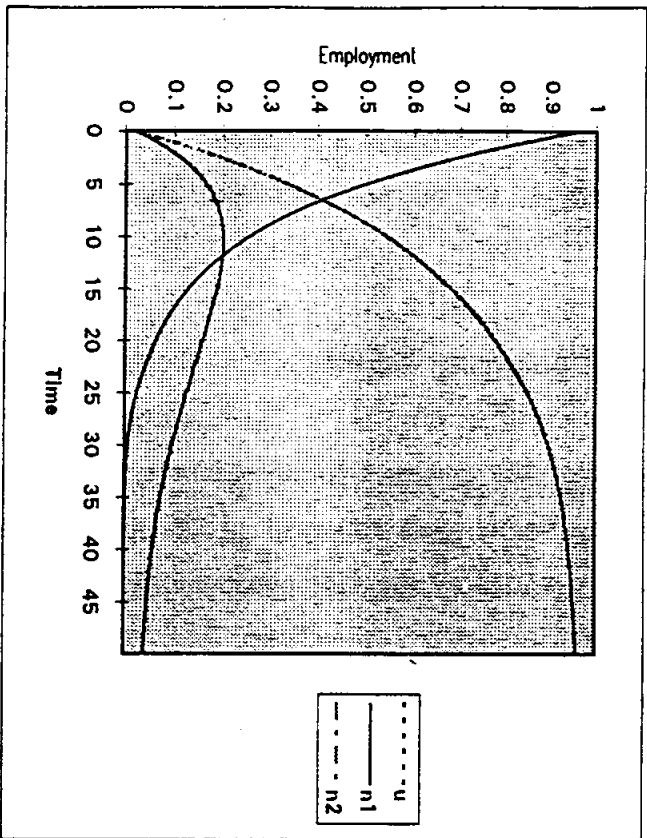
### **5. Inequality in Russia, 1992-1996**

We now pass on to the empirical core of the paper and present the main results concerning inequality and its changes since the start of transition drawing on the RLMS. We primarily work with the information that this dataset yields on income. While this could be expected to contain the usual type of measurement errors associated with income reporting, capital market imperfections and liquidity constrained households would also limit the relevance of consumption -- and hence the use of expenditures -- as a proxy for life-cycle welfare <sup>22</sup>. In addition, given the shape of the transition, we must be interested not only in the evolution of income inequality but also the evolution of income components. Using the income measure also facilitates

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<sup>22</sup> Note that if we use expenditures, rather than incomes, we get very comparable measures of inequality. The Gini for household expenditures ranges between 0.5 and 0.51 and is broadly stable through the period.

Figure 2  
 Parameters: Poverty Line/Benefits: 1.0; Benefits/Average wage=0.5



comparability with other estimates, including those pre-transition. We report per capita and household measures as well as looking at the sensitivity of our results to changes in equivalence scales.

*Table 5* brings together some standard summary statistics for both per capita and household measures as well as income shares by decile over time. The first point to note is the variation in the evolution of both real median and mean incomes. Over the full period -- 1992-1995 -- both experience a clear and convergent decline of between 20-23 percent but, for example, the sign would have been reversed if the previous round had been used. Second, median income remains significantly below mean income at around two-thirds, indicating clear skewedness to the right in the income distribution. The inequality measures -- the Gini coefficient and the Theil indices -- tell a striking story. In the first place, income inequality was already large by 1992; significantly larger than official estimates would suggest. Indeed, applying the official, Goskomstat approach to our dataset would have yielded a Gini of 0.34 for the per capita measure for Round 1 as against the estimate of 0.43 that we report <sup>23</sup>. The other feature is the unambiguous increase in inequality over the period. By 1995 the Russian per capita Gini was around 0.46. The household Gini shifts very slightly from 0.48 to 0.49 in the same period. Similar evolutions are observed for the Theil mean log deviation measure. The divergent movement in the Theil entropy measure must be related to clear decrease in the coefficient of variation for both per capita and household measures. The rise in inequality is generally monotonic through Round 5 with a slight decline in the last period. These evolutions are broadly commensurate with estimates from other data sources. For example, the VCIOM income surveys that are consistent in timing with Rounds 3 and 6 of the RLMS yield

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<sup>23</sup> Goskomstat adjusts survey-generated income data to be consistent with national accounts data.

Ginis of 0.52 and 0.48 in both periods for per capita and households respectively <sup>24</sup>.

The evolution of the decile ratio is informative. Here we observe a large and unambiguous increase over the full period for the per capita measure and a rather smaller increase for households. By the end of 1995 the decile ratio was in the range of 32-35; a very large disparity indeed. Further, looking at the ratios of the bottom and top deciles to the median, we can see that this has been powered by changes at both ends of the distribution; the former was between 20-45 percent lower and the latter roughly 10 percent higher by the end of 1995 than in 1992. These shifts are genuinely large.

Looking at the evolution of mean incomes by decile, there is significant fluctuation in real incomes by round across all deciles <sup>25</sup>. All -- bar the bottom four -- deciles experienced a growth in real income if we relate end-1994 to mid-1992. But between end 1994 and end-1995, however, all deciles experienced a decline in mean incomes. This resulted in all deciles experiencing a decline in mean income over the full period. The decrease was far larger -- between 25-40 percent -- in the two lowest deciles.

Turning to the share of total income appropriated by each decile, *Table 5* indicates that for the per capita measure only the top three deciles experienced an increase in their share over the full period <sup>26</sup>. The lowest four deciles experienced an unambiguous decline in their share. The two bottom deciles which initially commanded 5.5 percent of total income saw their share shrink further to 3.8 percent. The poorest decile indeed can be seen to have lost over a third of its original in total income, while the top two deciles gained by around 4 percent. How much of the increase in the income share has actually accrued to the richest 5 percent of individuals or households ? *Table 5* also shows that there is little evidence of the upper part of the decile

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<sup>24</sup> The Russian Centre for Public Opinion Polls (VCIOM) implements regular monthly surveys of individuals. The numbers reported here relate to the surveys for April 1993 and November 1995.

<sup>25</sup> These are not reported in detail here but are available on request.

<sup>26</sup> This is also true for Rounds 1-4 indicating that the result is robust to the panels.

**Table 5: Incomes, Inequality Measures and Shares for Population and Households 1992-95**  
( in constant June 1992 prices, deflated with regional CPI )

	R1	R2	R3	R4	R5	R6
<i>Population with percapita income ranking</i>						
Mean, Rbls.	2,846	2,025	2,963	2,727	2,888	2,185
Median, Rbls.	2,066	1,524	2,134	2,003	2,044	1,598
d1/median	0.284	0.237	0.236	0.221	0.188	0.151
d10/median	3.304	3.251	3.412	3.406	3.792	3.552
Decile ratio	18	19	20	22	29	32
Gini coefficient	0.426	0.419	0.441	0.439	0.465	0.458
Theil entropy index	0.407	0.359	0.417	0.404	0.442	0.395
Theil mean log deviation inde	0.329	0.328	0.356	0.360	0.418	0.422
Coefficient of Variation	1.86	1.47	1.57	1.55	1.50	1.19
Shares of deciles in total income						
1st (poorest) - d1	1.9%	1.7%	1.7%	1.5%	1.2%	1.1%
2nd	3.6%	3.3%	3.2%	3.1%	2.8%	2.7%
d3	4.6%	4.6%	4.4%	4.4%	4.0%	4.0%
d4	5.6%	5.8%	5.5%	5.5%	5.3%	5.3%
d5	6.7%	7.0%	6.6%	6.7%	6.5%	6.6%
d6	8.0%	8.3%	7.9%	8.0%	7.8%	8.1%
d7	9.6%	9.9%	9.5%	9.7%	9.4%	9.8%
d8	11.7%	12.1%	11.8%	12.0%	11.8%	12.2%
d9	15.1%	15.9%	15.7%	15.9%	15.9%	16.3%
10th (richest)- d10	33.3%	31.4%	33.9%	33.2%	35.4%	33.9%
Richest 5% of individuals	25.0%	21.5%	25.2%	23.7%	25.8%	25.5%
<i>Households with total household income ranking</i>						
Mean, Rbls.	7,821	5,656	8,388	7,604	8,463	6,346
Median, Rbls.	5,338	4,018	5,589	5,108	5,644	4,281
d1/median	0.202	0.239	0.229	0.243	0.205	0.163
d10/median	3.854	3.677	4.009	3.987	4.031	4.252
Decile ratio	27	21	25	23	30	35
Gini coefficient	0.484	0.456	0.483	0.475	0.489	0.490
Theil entropy index	0.482	0.407	0.488	0.460	0.486	0.437
Theil mean log deviation inde	0.436	0.380	0.425	0.409	0.454	0.477
Coefficient of Variation	1.61	1.52	1.81	1.68	1.73	1.19
Shares of deciles in total income						
1st (poorest) - d1	1.3%	1.6%	1.4%	1.5%	1.2%	1.0%
2nd	2.4%	2.7%	2.5%	2.6%	2.4%	2.3%
d3	3.5%	3.8%	3.6%	3.7%	3.6%	3.4%
d4	4.7%	5.0%	4.8%	4.8%	4.8%	4.7%
d5	6.1%	6.4%	6.0%	6.0%	6.0%	6.0%
d6	7.7%	8.0%	7.5%	7.6%	7.5%	7.6%
d7	9.7%	9.9%	9.5%	9.6%	9.4%	9.6%
d8	12.4%	12.7%	12.1%	12.3%	12.0%	12.3%
d9	16.4%	16.8%	16.4%	16.7%	16.4%	17.3%
10th (richest)- d10	35.7%	33.1%	36.2%	35.2%	36.6%	35.6%
Richest 5% of households	25.0%	23.1%	26.9%	25.2%	28.3%	26.4%

Source: RLMS; R1 - mid 1992, R2 - end 1992, R3 - mid 1993, R4 - end 1993, R5 - end 1994, R6 - end 1995

gaining disproportionately. This is also true if we concentrate on the top 1 percent.

In short, the RLMS data show that Russia entered the transition with significant inequality and this inequality has been magnified in the subsequent period. The decile ratio shows a very large increase over the period, at least when looking at per capita incomes. There were significant fluctuations in real income between rounds but taking the period from mid-1992 through to the end of 1995, there was a clear decline of around 20 percent. That decline was unevenly distributed. The lowest deciles experienced unambiguous declines in mean incomes and income share.

Finally, in this section it may be useful to report results for inequality when the measure of income is closer to revenues or cash flow. This involves including loans received as a component of capital income. While this is not standard practice, there may be some motivation for inclusion in the Russian context; namely the widespread use of 'loans' as labour payments to avoid taxation. While we have no exact way of determining the share of such loans that are indeed not repayable, inclusion has a quite substantial effect on inequality. The per capita Gini follows very much the same path but shifts from 0.43 in 1992 to 0.5 by 1995. In terms of income shares, the cash flow measure mainly affects the top of the distribution where by far the greatest change in income share was to the top decile. Their share in total income rose from 32.3 percent to 38.5 percent; a far larger change than that reported when using the more conventional measure of total income.

### **5.1 Sensitivity to equivalence scales and dominance**

Income data for the transition economies have historically been presented in per capita form, thereby making large assumptions about the absence of intra-household scale economies. While this may have been appropriate pre-transition, we would expect this assumption to become less valid as transition progresses. To test how sensitive two of the measures -- the Gini and the Theil Log Deviation index -- are to assumptions about household

scale economies, *Figures 3-4* plot both for different equivalence values or values of  $\theta$  (viz, 0.00, 0.25, 0.50, 0.75, 1.00) where the per capita form has  $\theta=1$ .

While, as expected, we find that inequality is sensitive to the choice of equivalence scale, it is also evident that whichever equivalence scale is applied, a picture of growing inequality generally, but not unequivocally, holds. This is particularly true for the per capita value. However, there is some clear reranking between rounds but -- at least in the case of the Theil measure -- each pair of rounds tends to dominate preceding rounds for any value of  $\theta$  that is applied. The main disturbance can be traced to the values for Round 1. Note that when we apply the equivalence scales to the cash-flow measure of income, we find that pairwise dominance holds unambiguously and whichever scale is used inequality is seen to be growing over time.

In terms of levels of inequality, we find that for households ( $\theta=0$ ) there is a notably higher level of initial inequality and a somewhat smaller amount of change over time. This is perhaps surprising if we think of households having scale economies. However, this finding can be attributed to the fact that at the start of transition inequality in one person -- largely pensioner -- households was very high. Given that their share in the total population was much smaller than their share in the number of households, the resulting inequality for  $\theta=0$  is higher than for  $\theta=1$  where the high inequality in one person households has less weight.

Finally, given the systemic changes occurring through this period and the idiosyncracies of the control economy, getting a robust measure of the change in social welfare is particularly complex. Nevertheless, turning briefly to stochastic dominance, *Figure 5* provides a Generalised Lorenz curve for the first and last rounds <sup>27</sup>. It can readily be seen that the curves intersect at

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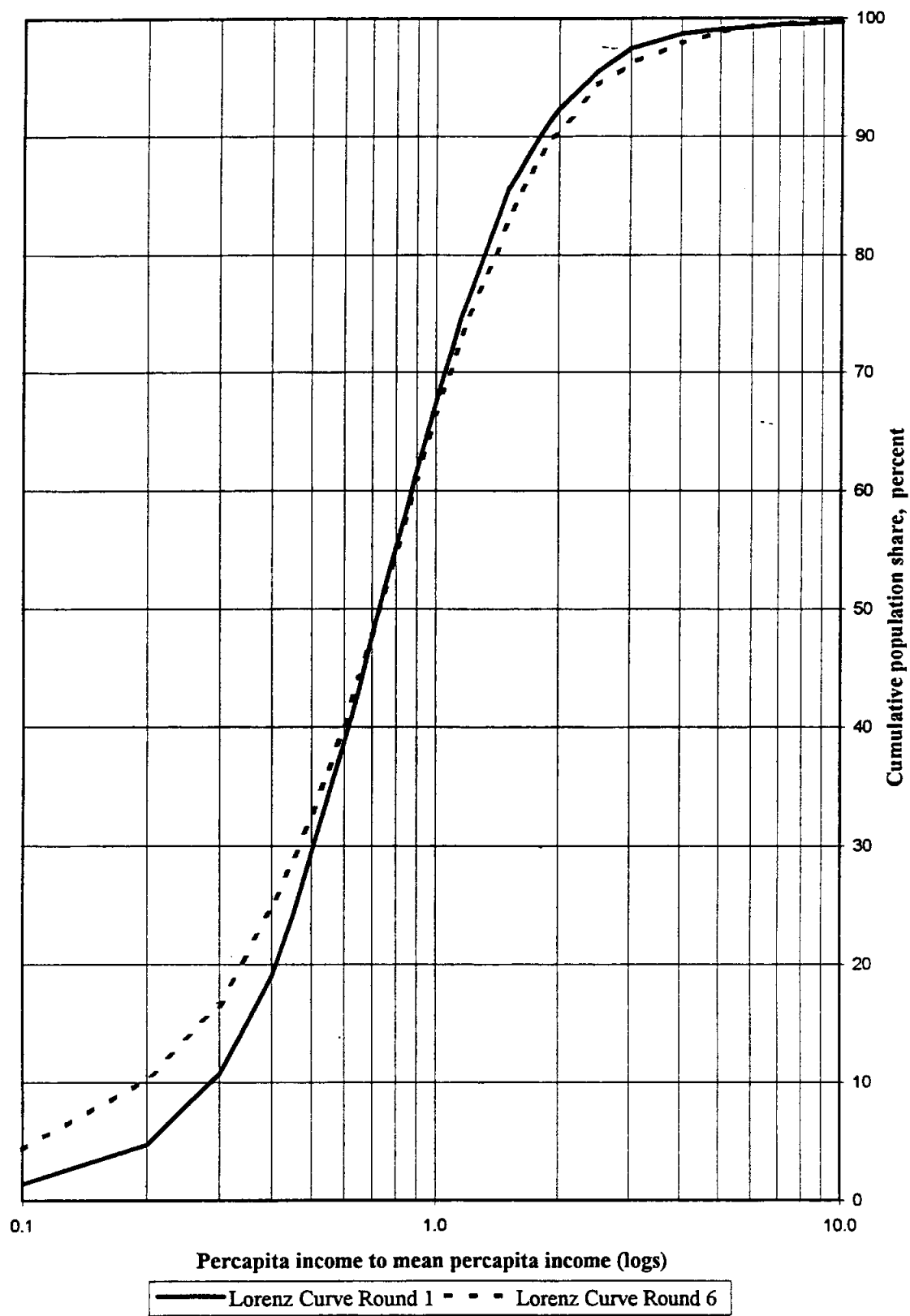
<sup>27</sup> The Generalised Lorenz Curve gives the cumulative share of income scaled up by the distribution mean against the cumulative share of the population and corresponds to second-degree stochastic dominance. Generalised Lorenz dominance is equivalent to preference measured by any increasing, strictly concave social welfare function.





Figure 5.

Generalized Lorenz Curves: 1992 (round1) and 1995 (round6)



various points and there is predictably no generalised Lorenz dominance of either 1995 or the 1992 observations.

## 5.2 Drivers behind the change in inequality

To understand better the factors propelling this shift in inequality, we first look at the composition of income over time, the respective concentration coefficients of the components of income and the contribution of each component to inequality. In making this analysis, we use the information available on household incomes. It is well established that the Gini can be decomposed by income components. The contribution of the components to total inequality can be obtained from the product of the concentration coefficient for each component and their respective weights in total income<sup>28</sup>. However, decomposition of the Gini by population groups is not very informative. To do that we must turn to the Theil measures -- the Theil entropy (T) measure and the Theil mean log deviation (L) measure<sup>29</sup>. Both are additively decomposable inequality indices so that aggregate inequality can be represented as a weighted sum of the same index for different groups -- the 'within' groups' component -- plus the value of the index if the income of every person in each group is equal to the mean income of that group -- the 'between' groups component. The Theil L measure has the additional virtue that it is not dependent on income shares but on group population shares and is thus strictly additively decomposable.

*Table 6* presents the basic information for several rounds on the composition of income, the respective concentration coefficients and through decomposition of the Gini, the contribution of each component to inequality. A number of striking features emerge. First, the share of wages in total income has collapsed, most dramatically in 1994 and 1995. From having accounted for

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<sup>28</sup> See Shorrocks (1982).

<sup>29</sup> Defined as; Theil  $T = (1/n) \sum_i (y_i/m) \ln(y_i/m)$  and Theil  $L = (1/n) \sum_i \ln(m/y_i)$ ,

where  $y$  denotes income,  $n$  is population size and  $m$  the arithmetic mean income of the population.

**Table 6: Structure of Household Incomes and Inequality.**

	Structure						Gini and concentration coefficients						Decomposition of Gini- shares in total inequality					
	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
	100%	100%	100%	100%	100%	100%	0.484	0.456	0.483	0.475	0.489	0.490	100%	100%	100%	100%	100%	100%
<b>Total Income</b>	100%	100%	100%	100%	100%	100%	0.484	0.456	0.483	0.475	0.489	0.490	100%	100%	100%	100%	100%	100%
<b>In-kind Consumpti</b>	5.5%	3.5%	8.2%	9.5%	13.4%	10.2%	0.435	0.416	0.492	0.430	0.483	0.341	5%	3%	8%	9%	13%	7%
From family farm	5.2%	3.1%	7.9%	9.0%	11.3%	8.4%	0.409	0.343	0.477	0.408	0.457	0.289	4%	2%	8%	8%	11%	5%
From entrepreneurial act.	0.3%	0.4%	0.3%	0.4%	2.1%	1.9%	0.891	0.947	0.857	0.879	0.622	0.574	1%	1%	1%	1%	3%	2%
<b>Monetary Income</b>	94.5%	96.5%	90.1%	90.1%	86.6%	90%	0.487	0.457	0.477	0.480	0.489	0.506	95%	97%	89%	91%	87%	93%
Wages and bonuses	61.5%	59.1%	52.7%	54.0%	30.6%	34.4%	0.554	0.541	0.520	0.554	0.525	0.564	70%	70%	57%	63%	33%	40%
Entrepreneurial	2.5%	1.5%	1.8%	0.5%	14.2%	12.8%	0.974	0.947	0.918	0.957	0.678	0.679	5%	3%	3%	1%	20%	18%
Self-employment	1.8%	2.2%	2.6%	3.1%	4.8%	5.0%	0.788	0.795	0.817	0.837	0.657	0.627	3%	4%	4%	5%	7%	6%
Farm products sold	2.7%	1.9%	2.5%	3.0%	3.9%	5.8%	0.555	0.501	0.752	0.779	0.646	0.715	3%	2%	4%	5%	5%	8%
From insurance			0.0%	0.1%	0.2%	0.0%			0.565	0.561	0.702	0.310	0%	0%	0%	0%	0%	0%
<b>Total Transfers</b>	24.3%	29.2%	25.2%	26.4%	27.6%	27.5%	0.206	0.194	0.200	0.197	0.230	0.241	10%	12%	10%	11%	13%	14%
State and firms to family	6.0%	4.7%	4.9%	4.1%	2.1%	2.4%	0.363	0.393	0.513	0.446	0.305	0.314	4%	4%	5%	4%	1%	2%
Private transfers	8.0%	6.8%	5.0%	5.6%	7.6%	7.5%	0.549	0.503	0.527	0.509	0.531	0.577	9%	7%	6%	6%	9%	9%
Pensions	10.3%	17.7%	15.1%	16.7%	17.6%	17.5%	-0.150	0.024	-0.011	0.031	0.081	0.088	-3%	1%	0%	1%	3%	3%
U Benefits	0.0%	0.1%	0.0%	0.0%	0.2%	0.2%	0.086	0.137	0.112	0.315	0.275	0.161	0%	0%	0%	0%	0%	0%
Other monetary income		1.8%	1.8%	0.4%	0.0%	0.0%			0.730	0.333	0.218	0.361	0%	0%	3%	0%	0%	0%
<b>Capital Income</b>	1.6%	2.7%	5.3%	3.1%	5.3%	4.2%	0.941	0.903	0.920	0.879	0.848	0.814	3%	5%	10%	6%	9%	7%
Capital gains			0.3%	0.2%	1.7%	1.1%			0.851	0.815	0.860	0.819	0%	0%	1%	0%	3%	2%
Property sales	1.6%	2.6%	4.8%	2.8%	3.5%	3.0%	0.953	0.921	0.929	0.894	0.850	0.835	3%	5%	9%	5%	6%	5%
From property	0.0%	0.1%	0.1%	0.1%	0.2%	0.1%	0.552	0.549	0.745	0.612	0.702	0.310	0%	0%	0%	0%	0%	0%

Source: RLMS round 1-4 (1992-93) and round 5-6 (1994-95), deflated using regional CPI (June 1992 prices)

over 60 percent of income at the start of transition, by 1994/95 the share had collapsed to around 30-35 percent. In the same period, while total transfers to household actually rose slightly, there was a substantial decline -- from 6 to 2 percent -- in the share of public transfers in household income. The main growth and stabilising factor in transfers has been with pensions. The rise in the income share of both entrepreneurial activity and self employment is also notable, rising from under 5 percent in 1992 to nearly 20 percent in 1994/95. We also find a clear growth in capital income, primarily though property sales. Even so, capital income only accounted for around 4 percent of total income by 1995. This picture is changed dramatically if the cash-flow income measure is applied and all loans received are assumed to be disguised labour income. In this case, the share of capital income has climbed from just over 4 to more than 20 percent between mid-1992 and end-1995.

How have these changes played out across different rungs of the income distribution, across regions and across employment status ? *Table 7* breaks down the income structure by quintiles across the first and last rounds. The evaporation of the wage share is common to all quintiles with growth in entrepreneurial and capital income particularly strong in the highest quintile. While the decline in other public transfers is across-the-board, the pension share has risen in all quintiles. The dependence on pensions is striking in the lowest quintile as is the implicit incidence of unemployment in the lower income brackets.

When disaggregating by macro-regions <sup>30</sup>, these shifts and their relative magnitudes are indeed generally replicated. The fall in the wage share is across-the-board but with the sharpest cut in rural areas. Counteracting growth in entrepreneurial and self-employment has been strongest in Moscow, St.Petersburg and other industrial centres. By 1995 these two components accounted for around 23 percent of total income. Perhaps surprisingly, we find

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<sup>30</sup> The macro-regions involve the following classifications; Moscow, St. Petersburg and surrounding oblasts; Industrial centres; Rural-Urban locations; Rural locations.

**Table 7: Structure of Household Income by Groups, 1992-1995**

**A. Structure of household income by quintiles (total household income ranked)**

	Poorest quintile		Second		Third		Fourth		Richest quintile	
	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6
<b>Total Income</b>	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<b>Total Monetary Income</b>	96.8%	90.1%	95.5%	89.7%	94.9%	90.2%	95.3%	87.8%	93.1%	90.7%
Wages and bonuses	37.5%	18.1%	55.5%	29.2%	62.5%	34.4%	66.1%	34.4%	64.4%	39.1%
Entrepreneurial	0.0%	5.0%	0.2%	9.1%	0.5%	9.8%	1.4%	13.0%	5.3%	16.8%
Self-employment <sup>1</sup>	3.4%	9.3%	5.4%	8.7%	4.4%	12.5%	3.5%	11.3%	5.2%	10.6%
<i>Total Transfers</i>	55.8%	54.5%	33.9%	41.5%	26.8%	32.2%	22.5%	24.4%	15.7%	17.9%
of which: pensions	42.8%	44.0%	20.2%	30.0%	11.3%	21.5%	7.2%	14.6%	2.8%	8.5%
<i>Capital Income</i>	0.0%	3.3%	0.5%	1.3%	0.6%	1.3%	1.8%	4.7%	2.6%	6.3%
<b>In-kind income</b>	3.2%	9.9%	4.5%	10.3%	5.1%	9.8%	4.7%	12.2%	6.9%	9.3%

**B. Structure of household income by employment status of household head**

	Managers		White collar workers		Blue collar workers		Pensioners		Self-employed and other	
	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6
<b>Total Income</b>	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<b>Total Monetary Income</b>	95.7%	91.4%	96.1%	93.2%	94.2%	88.9%	88.8%	85.5%	93.6%	86.9%
Wages and bonuses	67.2%	35.2%	68.5%	46.1%	68.9%	39.9%	15.9%	1.4%	40.7%	0.7%
Entrepreneurial	3.3%	32.1%	2.5%	12.1%	0.8%	15.6%	0.0%	0.2%	10.8%	1.7%
Self-employment <sup>1</sup>	6.5%	6.5%	3.5%	9.8%	4.4%	13.1%	4.1%	1.1%	8.9%	33.5%
<i>Total Transfers</i>	16.7%	11.9%	19.7%	18.3%	19.1%	17.1%	68.4%	82.8%	29.3%	40.7%
of which: pensions	2.5%	6.7%	5.3%	10.0%	5.3%	7.9%	59.7%	64.2%	12.1%	32.1%
<i>Capital Income</i>	2.0%	5.6%	1.9%	6.9%	1.0%	3.2%	0.4%	0.1%	3.8%	10.3%
<b>In-kind income</b>	4.3%	8.6%	3.9%	6.8%	5.8%	11.0%	11.2%	14.5%	6.4%	13.1%

**C. Structure of household income by type of location.**

	Moscow, St.Petersburg & Oblasts		Industrial centers		Semi-Urban locations		Rural locations		All Russia	
	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6	Round 1	Round 6
<b>Total Income</b>	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<b>Total Monetary Income</b>	95.5%	96.3%	96.2%	92.9%	96.1%	93.3%	87.6%	73.5%	94.5%	89.8%
Wages and bonuses	64.2%	44.0%	69.4%	38.2%	60.1%	36.8%	48.6%	15.7%	61.5%	34.4%
Entrepreneurial	1.1%	16.0%	0.8%	15.8%	5.7%	12.9%	1.4%	4.9%	2.5%	12.8%
Self-employment <sup>1</sup>	3.9%	8.5%	1.5%	7.4%	4.9%	6.7%	9.9%	24.0%	4.5%	10.8%
<i>Total Transfers</i>	25.0%	25.0%	22.9%	26.5%	23.7%	32.0%	25.8%	25.4%	24.3%	27.5%
of which: pensions	9.7%	15.0%	9.0%	17.0%	9.4%	20.9%	14.7%	15.9%	10.3%	17.5%
<i>Capital Income</i>	1.2%	2.8%	1.6%	5.1%	1.8%	4.9%	2.0%	3.4%	1.6%	4.2%
<b>In-kind Consumption</b>	4.5%	3.7%	3.8%	7.1%	3.9%	6.7%	12.4%	26.5%	5.5%	10.2%

Note: Round 1 - summer 1992, Round 6 - end 1995.

1. Including family farm products sold

no evidence as yet that expansion in capital income has been concentrated in Moscow and St. Petersburg.

Looking at income structure controlling for the employment status of the household head -- defined over five broad categories; managerial, white collar, blue collar workers, pensioners and self-employed/other -- the main findings are that, as expected, the expansion in entrepreneurial income has been particularly strong among managers. The share shifted from under 4 to over 34 percent in the period. Growth in capital income was also strong among managers, white collar workers and the self-employed but still accounted for no more than 10 percent of income at the end of the period. Declining public and enterprise provided transfers have affected all types of households. The main offset has been from pensions with a further, significant growth in private transfers for pensioner-headed households.

*Table 6* also provides the concentration indices for these components of income and their respective contributions to inequality. The concentration index of an income component measures how evenly or unevenly that component is distributed over household income. Of interest is the quite high concentration coefficient -- broadly stable through the period -- for wages. However, given the collapse in the wage share of total income, there is a correspondingly large change in the contribution to inequality. Both entrepreneurial and self employment income become very significantly less concentrated over the period -- but still more concentrated than wages -- and their share in inequality rises from around 8 to 25 percent. Capital income also becomes less concentrated over the period with its contribution to inequality rising to around 8 percent. Total transfers to households appear generally not to have been progressive throughout the period. However, public transfers have had lower concentration ratios than for total income suggesting that their distributional incidence has been broadly progressive. For pensions, the initial concentration values imply that this income component was distributed on a household basis with no targetting. But the

subsequent change points to a decline in progressivity. By 1994 pensions also contributed to inequality.

*Table 8* goes a step further and decomposes the change in inequality over the full period (1992-1995) allowing us to get some sense of the respective weights of changes in concentration in components, change in the share of the components in total income and an interaction term. We can immediately see that the overall change is small and mainly attributable to the change in own inequality. With the principal exception of wages, almost all components of income contribute to the change in inequality. Taking into account the interplay of shares over time, we find that the fall in the wage and the associated negative contribution to inequality has been completely offset by the combined effects of entrepreneurial activity, self employment and capital income <sup>31</sup>. Further, the main action has clearly been with respect to the structure of income; the change in income shares dominates in almost all cases, with the significant exception of pensions where 'within' changes dominate in raising inequality.

As already noted, the Theil mean log deviation index (Theil L) measure allows decomposition by population groups. *Table 9* provides a set of decompositions done with this index and with reference to selected factors one at a time identifying within and between effects <sup>32</sup>. The exercise is carried out for several groups of factors including the occupation or educational status of the household head, household size and by region (*oblast*) or location (macro region). For occupation, the relevant categories are managers, white collar, blue collar and self-employed or other. For the education variable we have three categories; household heads with higher, secondary or primary education

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<sup>31</sup> Note that if the same exercise is undertaken on a round-to-round basis, the results are less clearcut. Indeed, changes in 'own' inequality tend to be far more important than over the whole period. Clearly, the process generating inequality is far from linear with much variation over the shorter term.

<sup>32</sup> We also do the same decompositions using the Theil entropy measure which applies income shares. The results are broadly comparable and only the Theil L results are reported. The full set of results are available on request.



**Table 8: Decomposition of the change in Gini for household incomes between 1992 and 1995 by income components**

	<i>Round 1-6 (To Gini in Round 1)</i>			
	<i>Total</i>	<i>"Own" inequality</i>	<i>Shares change</i>	<i>Interaction term</i>
<b>Total Income</b>	<b>+1.2%</b>	<b>+2.8%</b>	<b>-0.5%</b>	<b>-1.1%</b>
<b>In-kind Consumption</b>	<b>+2.3%</b>	<b>-1.1%</b>	<b>+4.3%</b>	<b>-0.9%</b>
From family farm	+0.6%	-1.3%	+2.7%	-0.8%
From entrepreneurial activity	+1.7%	-0.2%	+2.9%	-1.0%
<b>Monetary Income</b>	<b>-1.1%</b>	<b>+3.9%</b>	<b>-4.8%</b>	<b>-0.2%</b>
Wage and bonuses	-30.3%	+1.3%	-31.0%	-0.6%
Entrepreneurial	+12.9%	-1.5%	+20.7%	-6.3%
Self-employment	+3.5%	-0.6%	+5.1%	-1.0%
Farm product sold	+5.5%	+0.9%	+3.5%	+1.0%
From insurance	+0.0%	+0.0%	+0.0%	+0.0%
<b>Total Transfers</b>	<b>+3.3%</b>	<b>+1.8%</b>	<b>+1.4%</b>	<b>+0.2%</b>
State and firms to family	-2.9%	-0.6%	-2.7%	+0.4%
Private transfers	-0.2%	+0.5%	-0.6%	-0.0%
Pensions	+6.4%	+5.1%	-2.2%	+3.5%
U Benefits	+0.0%	+0.0%	+0.0%	+0.0%
Other monetary income	+0.0%	+0.0%	+0.0%	+0.0%
<b>Capital Income</b>	<b>+3.9%</b>	<b>-0.4%</b>	<b>+5.0%</b>	<b>-0.7%</b>
Capital gains	+1.8%	+0.0%	+0.0%	+1.8%
Property sales	+2.1%	-0.4%	+2.8%	-0.3%
From property	+0.0%	-0.0%	+0.1%	-0.0%

33. The decomposition is done on the cross sections as well as for the change over the full period.

Several interesting results emerge. We can see that the between component particularly for the region, and to a lesser extent for the location, variables grows quite significantly across rounds. Over the whole period, the between component for regions accounts for almost all the change. In short, regional -- *oblast* level -- factors clearly become far more important over time in accounting for inequality. In terms of changes to relative incomes across location, predictably there is a clear increase in the relative income of Moscow and St.Petersburg. Turning to household size and the employment status of the household head we observe relatively large initial -- subsequently declining -- between components with the between share in the change over the full period actually going against the change in total inequality. For education, the within component accounts for almost all the variation. The between component remains small and stable across the rounds and also acts against the change in total inequality over the whole period. Relative mean incomes across the main categories also show remarkable stability. With employment status, the major change is for the within component, mostly among manager and blue collar categories.

Finally, we turn to pairs of factors and decompose the change in inequality for the Theil L index for education and location and employment and location, respectively <sup>34</sup>. The education-location pair points to several interesting features. First, while the between component gains in importance over time, the change is very small. The within component in inequality dominates. However, most of the action is concentrated in the group with secondary education located in urban centres and in rural areas. The contribution to within inequality for the higher education category remains very small. However, as expected, we do indeed find that the largest gains

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<sup>33</sup> We find that the household head's educational status is quite tightly associated with the educational level of other household members; there is a high rank-correlation with other adult household members.

<sup>34</sup> The detailed results are available on request.

**Table 9: Decomposition of Inequality in Household Incomes: Within and Between Components**

	R1	R2	R3	R4	R5	R6	Change R1-6 <sup>5</sup>
Theil mean log deviation L	0.43565	0.3799	0.424932	0.40876	0.45442	0.47727	+10%
<b>By Employment Status (Head of Household)<sup>1</sup></b>							
Component <u>within</u> groups	80%	83%	78%	86%	91%	83%	+14%
Component <u>between</u> groups	20%	17%	22%	14%	9%	17%	-9%
<i>Between in round-to-round change<sup>5</sup></i>		44%	68%	215%	-44%	179%	against
<b>By Education of Household Head<sup>3</sup></b>							
Component <u>within</u> groups	93%	95%	96%	94%	95%	95%	+13%
Component <u>between</u> groups	7%	5%	4%	6%	5%	5%	-30%
<i>Between in round-to-round change<sup>5</sup></i>		18%	-8%	-45%	-1%	-9%	against
<b>By Regions</b>							
Component <u>within</u> regions	92%	94%	92%	90%	90%	84%	+1%
Component <u>between</u> regions	8%	6%	8%	10%	10%	16%	+106%
<i>Between in round-to-round change<sup>5</sup></i>		25%	27%	-24%	17%	129%	94%
<b>By Types of Location<sup>2</sup></b>							
Component <u>within</u> locations	98%	98%	98%	96%	97%	97%	+9%
Component <u>between</u> locations	2%	2%	2%	4%	3%	3%	+45%
<i>Between in round-to-round change<sup>5</sup></i>		6%	0%	-50%	-1%	1%	11%
<b>By Size of Household<sup>4</sup></b>							
Component <u>within</u> groups	80%	79%	77%	78%	84%	87%	+19%
Component <u>between</u> groups	20%	21%	23%	22%	16%	13%	-27%
<i>Between in round-to-round change<sup>5</sup></i>		13%	41%	61%	-37%	-35%	against

Notes: 1. Managers, White Collar, Blue Collar, Pensioners, Working age adults w/o Primary Employment

2. Capitals & oblasts, Industrial cities, Urbanized areas, Rural areas

3. Primary or lower, secondary or vocational, higher or PHD.

4. By 4 size groups: with one member, with 2 members, with 3 members and with 4 and more members

5. Negative sign or "against" in cases when the "between" component has changed in the opposite direction to overall inequality change

have been made by those with higher education and located in the major cities. For this group, mean income was over 30 percent higher in 1995 than in 1992 and their relative position also improved substantially. The employment-location pair shows a slightly larger growth in the between component; even so inequality across these categories only accounted for around 14 percent by end-1995. Managerial and white collar workers -- particularly those located in the major cities -- saw a small improvement in their relative income position with blue collar and pensioners broadly stable.

To summarise these findings; there has been a large shift in the composition of income. Wage income has fallen away dramatically as entrepreneurial, self-employment and capital income have increased. These have generally contributed to a growth in inequality. Transfers have declined as a share of income and have not for the most part been progressive. When turning to the drivers, we found that region and location factors have come to play an increasingly important role in accounting for inequality. While relative income data show that educational attainment and employment status in 1992 and at end-1995 were indeed associated conventionally with higher relative incomes, there is no evidence of large shifts either within or between categories. Variation within categories has in fact been most significant among blue collar workers. Variation across education or employment status has not been as important in accounting for inequality as region.

## **6. Transitions**

It is evident that since 1992 there have been major changes in the level of inequality and these have been largely driven by changes in the composition of income. Yet an obvious question remains; how stable are these

distributions ? We now look more closely at the stability properties of the income distribution, using information from our two panels <sup>35</sup>.

A picture of significant income mobility emerges. *Table 10* gives some sense of mobility across four rounds or one and a half years (mid 1992-end 1993), as well as over one round or one year (1994-95). It shows that for both panels between 26-38 percent of households in quintiles 2-4 stayed in the same quintile at the end of the period. For these quintiles, mobility is largely to a neighbouring quintile. Households grouped in the bottom and top quintiles had notably higher survival rates in the range of 42-53 percent. Moreover, using expenditure data yields very much the same picture. The fact that the highest survival rate can be found in the lowest quintile likely also tells us something about the stability of poverty distributions. However, these survival rates are significantly smaller than in either Hungary and Poland, suggesting less entrenched poverty and relatively greater mobility at the bottom of the distribution in Russia than in Central Europe. We return to this issue below.

Looking at transitions over individual rounds in the first panel gives a picture of even greater mobility in the income distribution. *Figure 6* presents simple Kaplan-Meier survival functions for the respective income quintiles -- the probability of surviving in the originating quintile in the next round -- for the first panel. By the fourth round a tiny share of the initial population of the mid-quintiles remained at their starting levels. For the top and bottom quintiles, the share of households that made no transition was between 20-30 percent. In short, we find no stability among the mid-quintiles and only a minority of households were stable at the poles of the distribution.

What process best characterises these transitions ? A common description of mobility is, of course, the first order Markov process where future income depends on current income but not on past income levels. But such a process maps poorly to the mobility described by this dataset. Aside from globally underestimating stability, departures from predicted values are particularly large in the top and bottom quintiles. The empirical transition

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<sup>35</sup> Viz., Rounds 1-4 and Rounds 5-6.

**Table 10: Transition Matrix for Households between Income Quintiles**

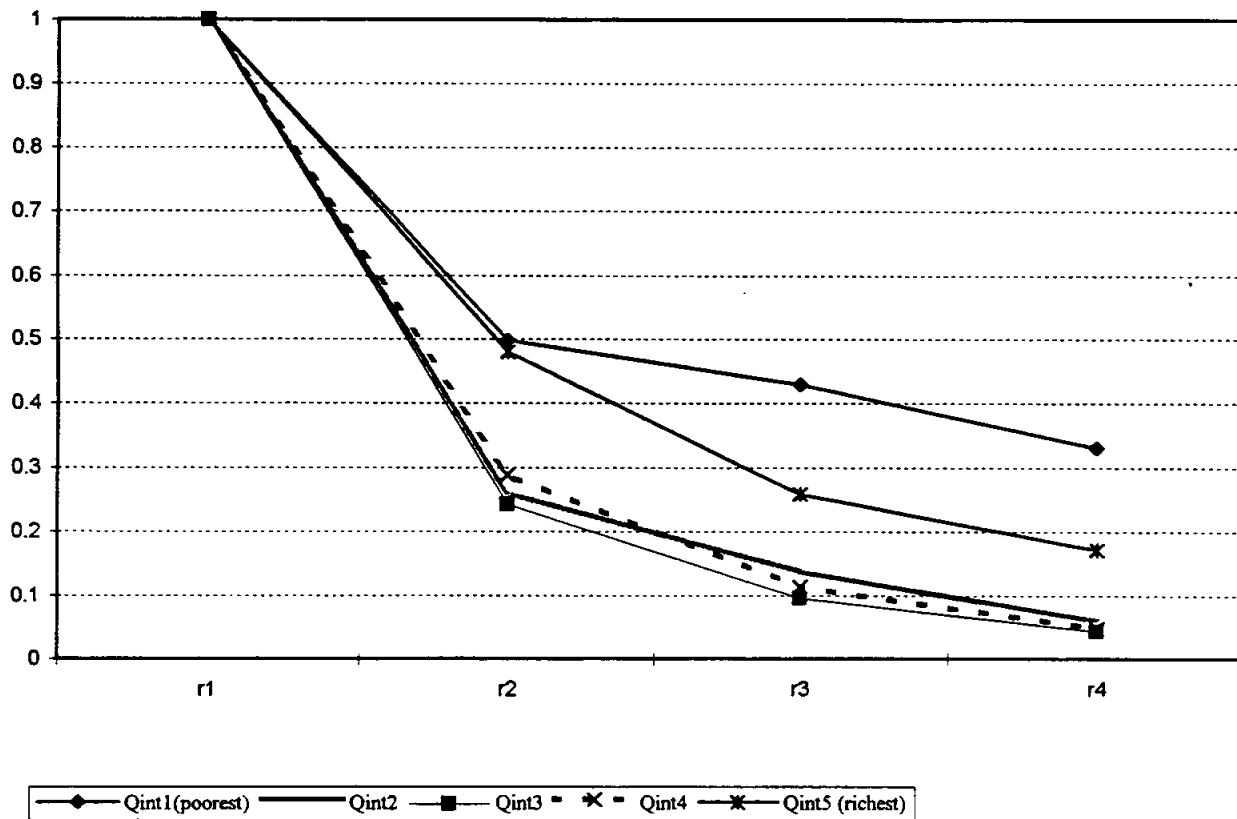
		<i>Final (r4)</i>					
		1st (poorest)	2nd	3rd	4th	5th (richest)	
<u>Round 1 to 4</u>	1st (poorest)	0.53	0.26	0.12	0.06	0.04	
	2nd	0.20	0.31	0.26	0.14	0.09	
	<i>Starting (r1)</i>	3rd	0.14	0.21	0.26	0.22	0.18
	4th	0.07	0.14	0.22	0.30	0.27	
	5th (richest)	0.06	0.08	0.15	0.29	0.42	

		<i>Final (r6)</i>					
		1st (poorest)	2nd	3rd	4th	5th (richest)	
<u>Round 5 to 6</u>	1st (poorest)	0.51	0.24	0.11	0.08	0.06	
	2nd	0.24	0.38	0.20	0.12	0.05	
	<i>Starting (r5)</i>	3rd	0.11	0.21	0.32	0.22	0.15
	4th	0.08	0.11	0.24	0.32	0.25	
	5th (richest)	0.06	0.06	0.13	0.27	0.48	

Source: RLMS; (r1) round 1 - mid 1992, (r4) round 4 - end 1993; (r5) round 5 - end 1994, (r6) round 6 - end 1995.

**Figure 6. Kaplan-Meier estimates of the survivor function**



rates are significantly higher for the tails. A second order Markov process -- allowing transition rates to depend on both current and past income -- appears more appropriate <sup>36</sup>.

### 6.1 Winners and losers in the income distribution

Our results have shown some instability in the income distribution. Given the presence of high inflation, large macroeconomic fluctuations and uncertainty over the direction of policy in the period covered by the first panel, these results may not be that surprising <sup>37</sup>. Interestingly, stability in the second panel is significantly larger, suggesting that some of the initial volatility has abated. Nevertheless, the evidence strongly cautions against assuming that shifts in the income distribution tend to be permanent and hence to making categorical statements about winners and losers in the transition.

A more restrictive exercise does, however, seem warranted by these findings. That is, we know that roughly 10 percent of households at both poles of the distribution have remained stable in their income quintiles throughout the period. What are the characteristics of these groups of stable winners and losers ?

*Table 11* provides the results from two sets of probit estimates in which being being stable in either the top or bottom of the income distribution is the right hand side variable. Stable winners over the first four rounds comprise no more than 4 percent and stable losers 7 percent of households. We can see that winners clearly tend to be located in the major cities and, to a lesser degree, in other urban areas. There is an unambiguous preponderance of managers and white collar workers in this category. There is a clear positive link from educational status of the household head to being a winner. For example, the share of those with higher education is just about double their

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<sup>36</sup> See Shorrocks (1976).

<sup>37</sup> Note that there is great instability for both household incomes and expenditures. The correlation coefficients for income between Rounds 1 and 4 are 0.1 and 0.29 respectively. For incomes, low correlation is particularly striking among the mid-quintiles. It also likely

**Table 11: Probit Estimates for Stable Winners and Losers (Rounds 1-4).**

Probit Estimates for stable losers Number of obs = 4819  
 chi2(13) = 718.23  
 Prob > chi2 = 0.0000  
 Log Likelihood = -828.40159 Pseudo R2 = 0.3024

alwbot	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dependrt	.7683153	.1437304	5.346	0.000	.4866089	1.050022
rural	-.1708784	.0863508	-1.979	0.048	-.3401229	-.0016339
indisctr	-.0895157	.1040474	-0.860	0.390	-.2934449	.1144135
cpitals	-.1434721	.119421	-1.201	0.230	-.377533	.0905888
wcol	-1.283881	.1739271	-7.382	0.000	-1.624772	-.9429906
bcol	-.9750257	.1143195	-8.529	0.000	-1.199088	-.7509636
hied	-.4815948	.158185	-3.045	0.002	-.7916318	-.1715579
seced	-.3302372	.0835147	-3.954	0.000	-.493923	-.1665514
LANDPLOT	-.1653036	.0867501	-1.906	0.057	-.3353307	.0047236
DACHA	-1.027146	.4258154	-2.412	0.016	-1.861729	-.1925634
GARAGE	-.5154819	.1663856	-3.098	0.002	-.8415917	-.1893722
CARDOM	-.1677222	.2279827	-0.736	0.462	-.6145601	.2791156
CARFOR	-.75209	.4867966	-1.545	0.122	-1.706194	.2020138
_cons	-1.146243	.1567577	-7.312	0.000	-1.453483	-.8390037

Probit Estimates for stable winners Number of obs = 4819  
 chi2(13) = 196.90  
 Prob > chi2 = 0.0000  
 Log Likelihood = -617.12083 Pseudo R2 = 0.1376

alwtop	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dependrt	-.5918949	.1461014	-4.051	0.000	-.8782484	-.3055414
rural	-.1110321	.1198133	-0.927	0.354	-.3458618	.1237976
indisctr	.3533789	.0990933	3.566	0.000	.1591597	.5475981
cpitals	.4564714	.114206	3.997	0.000	.2326317	.6803111
wcol	.4445986	.1658105	2.681	0.007	.119616	.7695812
bcol	.4509675	.1639729	2.750	0.006	.1295864	.7723485
hied	.5806539	.1530761	3.793	0.000	.2806303	.8806776
seced	.47423	.1267306	3.742	0.000	.2258425	.7226175
LANDPLOT	.3887219	.09394	4.138	0.000	.2046028	.572841
DACHA	-.1904254	.1404848	-1.355	0.175	-.4657705	.0849197
GARAGE	.2358038	.0992175	2.377	0.017	.041341	.4302666
CARDOM	-.0095558	.1344122	-0.071	0.943	-.2729988	.2538872
CARFOR	.3128052	.1461863	2.140	0.032	.0262853	.599325
_cons	-2.898108	.2126824	-13.626	0.000	-3.314958	-2.481258

**Variables:**

alwbot - equals 1 if stayed in the bottom quintile all 4 rounds, 0 otherwise;  
 alwtop - equals 1 if stayed in the top quintile all 4 rounds, 0 otherwise;  
 dependrt - dependency rate for household;  
 rural - equals 1 for living in rural areas, 0 otherwise;  
 indisctr - equals 1 for living in industrial centers, 0 otherwise;  
 cpitals - equals 1 for living in Moscow, St.Petersburg and oblasts, 0 otherwise;  
 wcol - equals 1 if household head is manager of white-collar worker, 0 otherwise;  
 bcol - equals 1 if households head is blue-collar worker, 0 otherwise;  
 hied - equals 1 for households headed by a person with higher education, 0 otherwise;  
 seced - equals 1 if household head has a secondary education only, 0 otherwise;  
 LANDPLOT - equals 1 for households having access to landplots, 0 otherwise;  
 DACHA - equals 1 for households owning a dacha, 0 otherwise;  
 GARAGE - equals 1 for households owning a garage, 0 otherwise;  
 CARDOM - equals 1 for households owning a domestically produced car, 0 otherwise;  
 CARFOR - equals 1 for households owning a foreign car, 0 otherwise.



share in the population. Successful households also tend to be associated with lower dependency ratios. The limited set of asset variables indicate that there is a clear emerging link from both car and housing ownership -- the principal asset -- to doing well. Winners tend to have a higher share of own apartments.

Turning to the other side, we find that losers are quite evenly distributed across locations; the shares are close to those in the population, with only rural areas having a higher hazard. There is a negative and predictable correlation with employment status. What is very striking is the huge preponderance of pensioners -- and hence of small households -- in the bottom quintile. The group risk for pensioners was over 26 percent and the share among losers was nearly four times larger than their share in the population. Educational status is also predictably negatively associated with losing. Over two-thirds of this category have received no more than primary education. Finally, asset ownership is clearly smaller. There is far less apartment ownership in urban areas.

### 7. Measuring poverty

It is now widely accepted that the early years of transition were associated with a sharp increase in the incidence of poverty, relative to Soviet levels<sup>38</sup>. The large price shocks of 1991/92 appear to have seriously cut into real incomes, though by what magnitudes relative to 1990 are difficult to say, given the earlier presence of pervasive shortages.

Measurement of poverty through the construction of an appropriate poverty line in Russia has to date suffered from a variety of shortcomings, particularly the failure to account for the wide regional variation in prices. Official estimates rely on income data with changes in the aggregates used. We prefer for the poverty analysis to rely primarily on the expenditure data

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indicates the absence of effective mechanisms for smoothing consumption and incomes in the face of volatility.

<sup>38</sup> The most comprehensive analysis is that by Klugman et al (1997).

from the RLMS <sup>39</sup>. As a consistency check we also report estimates based on incomes. Both expenditure and income information are deflated with region price deflators. We use the Goskomstat food basket and adjustment coefficient for non-food expenditures to get region-specific poverty lines for each round <sup>40</sup>. Later, we look at the sensitivity of the poverty measures to changes in equivalence scales.

*Figure 7* tells the basic story by giving the headcount measure, the poverty gap and the squared poverty gap <sup>41</sup>. From these standard measures, we respectively get a sense of the incidence and intensity of poverty as well as the extent of inequality amongst the poor. We can see that poverty had indeed become widely prevalent at the start of transition; roughly half the population by our expenditure measure fell below the poverty line in mid-1992. This incidence holds for both expenditure and income measures and is notably higher than the headcount given by official statistics. Since 1992 our measures and those of Goskomstat are broadly the same in terms of trend. With the exception of a slight increase from end-1994 to end-1995, the poverty headcount has declined consistently. By Round 6 just under one third of the population was below the poverty line by the expenditure measure. This represents a large decline from mid-1992. Our income measure gives a significantly higher incidence -- at around 45 percent -- but again one that represents a decline over 1992. Of interest is the fact although the Goskomstat headcount remains clearly lower, the trend pretty much mirrors that for the RLMS-based measures. *Figure 7* also shows that the poverty gap and the squared poverty gap -- or Foster-Greer-Thorbecke measure -- have declined

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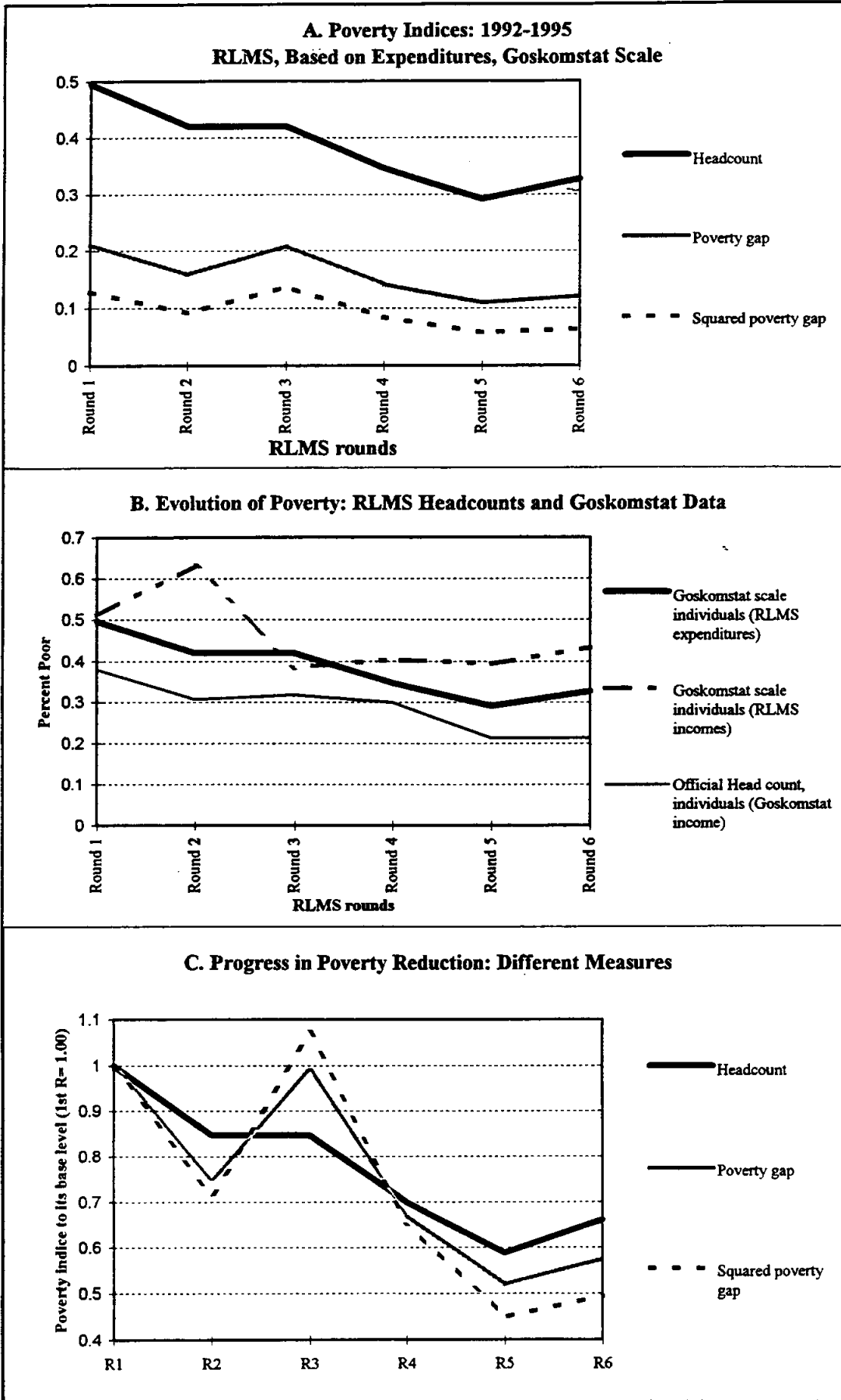
<sup>39</sup> Note that like for income, real expenditures fluctuate significantly across rounds. However, there is an unequivocal increase in real expenditures across the full period for all deciles.

<sup>40</sup> While large relative price changes might be expected to make the Engel coefficient unstable over time, a crude consistency check with our expenditure data suggests that the common adjustment that we apply is not inappropriate.

<sup>41</sup> The most general expression for these measures is; 
$$p = \frac{1}{n} \sum_{i=1}^n \left[ \max\left(1 - \frac{y_i}{y^*}, 0\right) \right]^\alpha$$
 where  $\alpha$  is

the poverty aversion parameter. The headcount measure corresponds to  $\alpha=0$ , the poverty gap to  $\alpha=1$  and the squared poverty gap to  $\alpha=2$ .

Figure 7.



over the period. The fact that the poverty gap has fallen more than the headcount indicates that the poor on average were closer to the poverty line at the end of the period. The yet larger decline in the squared poverty gap shows that expenditures among the poor were distributed more equally at the end of the period.

How much of this change in poverty can be attributed to changes in the distribution of income as against changes in expenditures ? *Table 12* decomposes the change in poverty into growth and redistribution components for both expenditure and income measured poverty <sup>42</sup>. We can see that over both panels, the largest effect by far has been exerted by the income or growth component. In the first panel, the income component accounts for over 80 percent of the decline in poverty with relative price also contributing to decrease poverty. By contrast, the redistribution component tended to raise poverty, albeit by small magnitudes. For the second panel where the poverty headcount increases, again the main effect is through the income component. The redistribution effect is small and, if anything, poverty reducing.

In sum, the incidence of poverty and the size of the normalised poverty deficit have unambiguously declined as transition has proceeded. Over both panels, expenditure or income growth has been the major factor driving this outcome. Changes in the distribution of income acted to raise poverty but not by large amounts. Even so, the share of the population in poverty -- ranging between a quarter at official estimates and between 32 - 45 percent using RLMS data -- remains high and, as we shall, among them are a substantial number who appear to be mired in poverty with little chance of escape.

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<sup>42</sup> This follows Datt and Ravallion (1992) with one important change; we do not apply a fixed poverty line. For a given poverty measure,  $p_t = p(z/m_t, L_t)$  where  $z$  = the poverty line;  $m$  = mean income and  $L$  is a vector of parameters describing the Lorenz curve, the growth component of a change in the poverty measure is defined as the change in poverty due to a change in the mean, holding the Lorenz curve constant at some reference level,  $L_r$ . The redistribution component is the change in poverty due to a change in the Lorenz curve keeping mean income constant at the reference level,  $m_r$ .

**Table 12: Decompositions of Changes in Poverty Headcounts (Expenditure and Income Based) into Growth and Redistribution Components**

	<b>Panel 1 (round 1-4)</b>		<b>Panel 2 (round 5-6)</b>	
	In % points	In % to initial	In % points	In % to initial
<i>Expenditure</i>				
Change in Poverty Headcount	-0.1391749	-30%	0.0223669	+8%
of which				
Growth Component	-0.1170877	-25%	0.1024765	+35%
Redistribution Component	0.0288728	+6%	-0.0045901	-2%
Relative Price Effect	-0.06191	-13%	-0.0728293	-25%
Residual**	0.01095	+2%	-0.0026902	-1%
<i>Income</i>				
Change in Poverty Headcount	-0.0792827	-17%	0.0496948	+12%
of which				
Growth Component	-0.042754	-9%	0.1514205	+38%
Redistribution Component	0.0404636	+8%	-0.010407	-3%
Relative Price Effect	-0.0814825	-17%	-0.0794123	-20%
Residual**	0.0044902	+1%	-0.0119064	-3%

Note: Goskomstat equivalence scale, poverty line estimated at local prices; all values at constant june 1992 prices

\*\* Includes also an effect of the demographic composition change

## 7.1 Poverty and household scale economies

Before turning to a closer look at the characteristics of the poor, the sensitivity of our poverty measures to the per capita specification needs to be examined. If we again apply a simple class of equivalence scales -- allowing  $\theta$  to vary between 0 and 1 -- to our scalar measures of poverty, we find predictably that the expenditure poverty headcount declines dramatically from just under 50 to around 23 percent in the case of Round 1 for  $\theta=1$  and  $\theta=0$  respectively and from around 32 to 7.5 percent for Round 6. Clearly, our scalar measures are very sensitive to the choice of equivalence scale, even if the trend of decreasing poverty is robust to the choice of equivalence scale. If we think that household fixed costs were rising over the transition, a per capita based measure would give an upper bound to the level of poverty.

To get some sense of the appropriate value for  $\theta$  for each round, we regressed aggregate household expenditures against household size and demographic variables -- including the share of the elderly and children in the household -- as well as correcting for differences in prices by using the value of the regional poverty basket <sup>43</sup>. We find that the value of  $\theta$  is not constant over time, going from just over 1 in 1992 to around 0.75 in 1993/94 and to 0.66 by 1995. This indicates that the per capita equivalence scale may well be appropriate for the early but not for the later rounds. Household fixed costs appear to have been rising. This has several important implications. In the first place, applying appropriate values of  $\theta$  to each round would imply a yet sharper decline in the poverty headcount from around 50 percent in mid-1992 to around 15 percent at the end of 1995. Second, it suggests that when looking at the characteristics of the poor, it would be more appropriate to define the poor in each round with these critical values of  $\theta$  rather than using the unadjusted poverty measure; a procedure that we adopt below.

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<sup>43</sup> Following the approach suggested by Lanjouw and Ravallion (1996).

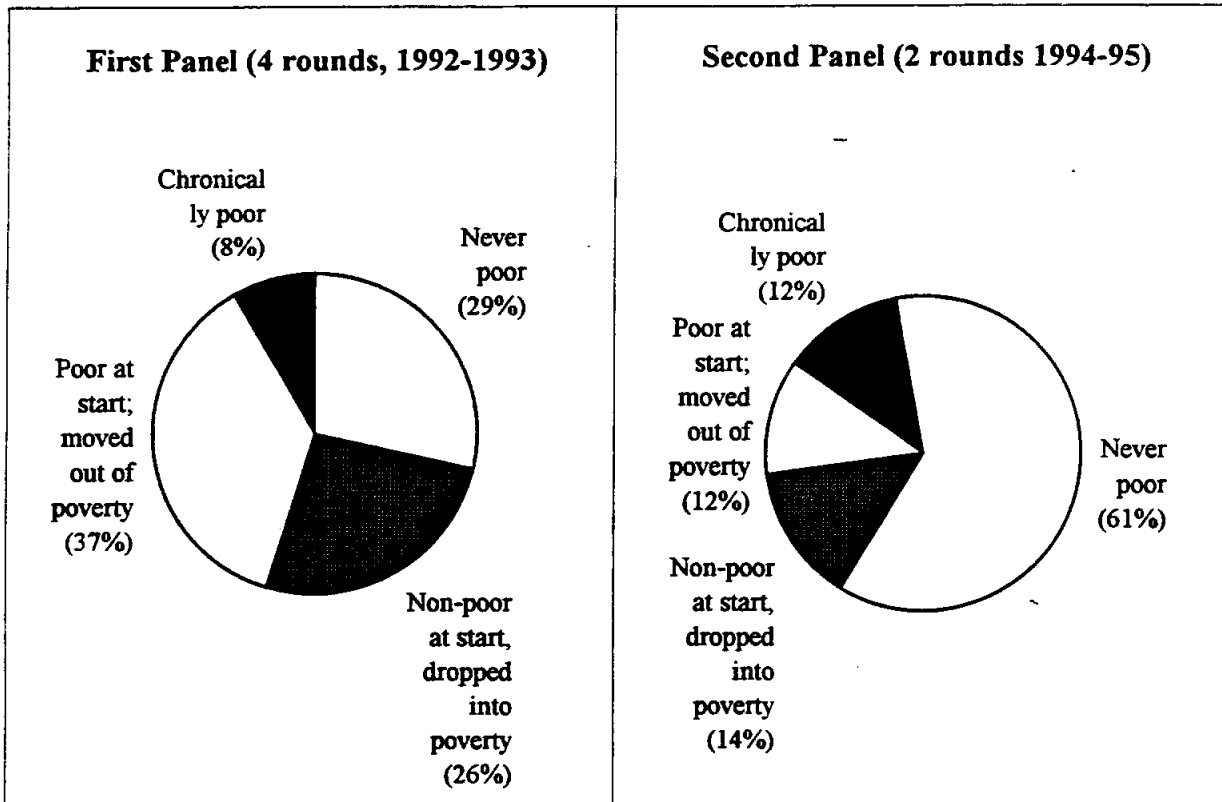
## 7.2 Poverty transitions and characteristics

Poverty has unambiguously declined since the extraordinarily high levels attained at the start of the transition. What do we know about the stability of the poverty distribution over this period ?

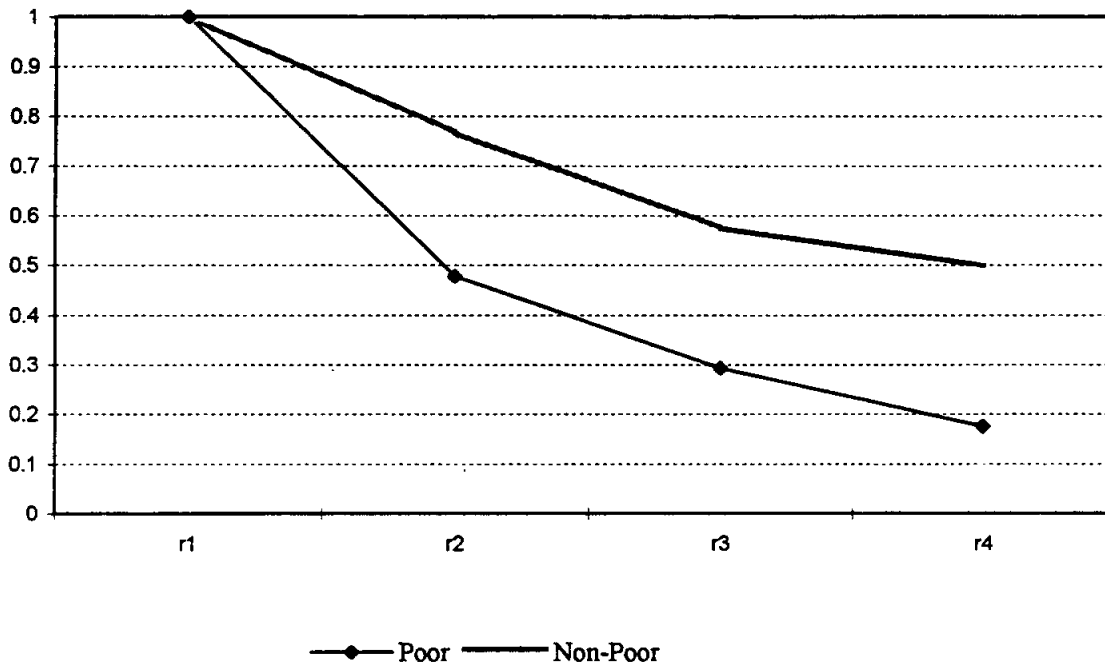
*Figure 8* begins to tell an interesting story that matches the picture of mobility in the income distribution. We can immediately see that there is indeed a small, stable core of households who remain poor throughout the period covered by both panels. They account for between 8-12 percent of households. By contrast, just under 30 percent of households were non-poor throughout the period of the first panel and over 60 percent in the course of the second. The Kaplan-Meier survival estimates presented in *Figure 9* also show that just under 20 percent of households in Round 1 who were poor in mid-1992 remained poor throughout and, at the other pole, around 50 percent of households that were non-poor at the start remained non-poor throughout. Clearly, a significant number of households have moved in and out of poverty in the intervening period. Even in the second panel in an environment of lower inflation and volatility, we find that in the course of a year nearly 30 percent of households in the panel had an episode of poverty. The round-by-round movements in and out of poverty are comparably large.

Turning now to a brief look at the stable or chronically poor, we provide a simple but informative profile of this group for both panels in *Table 13*. The headcount measure used to identify this stable poverty group has been calibrated using our round-by-round estimates of  $\theta$ . What emerges is that in terms of location, poverty is very evenly distributed and in proportion to the population, particularly in the first panel. What is unequivocal is the weight of pensioners -- and hence of small households -- among the chronically poor. The share in poverty is roughly double their share in the population; in all around 13 percent of this category are poor throughout the period. Educational status is predictably and negatively associated with being in poverty. Even so, we do find some incidence of poverty among households headed by people with higher education. Finally, with the exception of car

Figures 8-9.



**Figure 9. Kaplan-Meier estimates of the survivor function**



Note: Expenditure data, Goskornstat equivalence scale.



ownership, household housing portfolios are not particularly informative. While their housing is somewhat worse than the non-poor, the chronically poor do not have an asset profile that is markedly different from the population at large. This suggests that poverty is not robustly associated with an absent market; namely that for housing. The chronically poor are unlikely to be able to realise major gains from property disposals.

## 8. Conclusion

Russia entered the transition with significant inequality. This finding -- striking and quite surprising -- implies that already by 1992 income inequality was comparable, for example, to that existing in the U.S.A. and significantly greater than in the former planned economies of Central Europe. Using a large household dataset, our estimates of inequality suggest that official figures have grossly understated the degree of inequality. Further, since the start of transition, inequality has been clearly trended and the increase in under four years has been significant. Russian inequality, as measured by a Gini approaching 0.5, is now comparable to that in countries such as Mexico, Colombia or Malaysia.

Driving this increase in inequality have been a variety of factors. Clearly important -- but dealt with in a very limited way in this paper -- has been the large transfer of public assets into private hands. Privatisation of firms and housing proceeded rapidly in this period and will surely have profound longer run consequences for the income distribution. But even as privatisation has played itself out, other factors -- including changes to the level and composition of government spending, changes in the wage setting, in unemployment and in the macroeconomic environment -- have all tended to raise inequality. Government spending on social assistance and allied subsidies have generally declined in real terms. Public transfers to households have declined substantially. At the same time, earnings dispersion has risen sharply in the wake of liberalisation in wage setting and with the growth of a private sector.

**Table 13: Profile of Chronically Poor 1992-95 (Based on Changing Scale Economies)**

Group of households	Share in population rounds 1-4, %	Share among chronically poor rounds 1-4, %	Incidence of chronic poverty round 1-4	Share in population rounds 5-6, %	Share among chronically poor rounds 5-6, %	Incidence of chronic poverty rounds 5-6
<i>All households</i>			7%			7%
<i>By location:</i>						
Moscow, StPetersburg	15.45	16.13	7%	15.77	12.44	5%
Other urban dwellers	59.32	57.37	6%	57.14	65.79	8%
Rural population	25.23	26.5	7%	27.09	21.77	6%
<i>By employment status:</i>						
Managers	1.29	0	0%	3.3	0.44	1%
White-collar workers	30.94	15.85	3%	22.36	10.22	3%
Blue-collar workers	35.66	27.38	5%	39.98	32	6%
Pensioners	20.85	40.35	13%	28.71	48.89	12%
Self-employed and other	11.26	16.43	10%	5.65	8.44	10%
<i>By education of h/h head</i>						
Higher	15.96	8.36	4%	17.59	7.11	3%
Secondary	50.26	41.50	6%	52.05	45.33	6%
Primary	32.07	46.69	10%	28.99	42.67	10%
<i>By size of households:</i>						
1	18.82	27.38	10%	17.62	32.44	13%
2	29.14	32.28	7%	26.73	17.78	5%
3	21.44	18.16	6%	23.27	18.67	6%
4	21.3	12.97	4%	20.4	14.22	5%
>5	9.32	9.21	7%	11.97	16.89	10%
<i>Asset ownership:</i>						
Living in (own) apartment	58%	50%	6%	60%	54%	6%
Living in dormitories	3%	3%	7%	4%	4%	7%
Living in communal appart.	7%	8%	8%	3%	4%	9%
Renting a room	2%	1%	3%	5%	5%	7%
Owning a house	30%	38%	9%	28%	34%	8%
Owning dacha	6%	2%	2%	23%	8%	2%
Owning a car	24%	6%	2%	22%	7%	2%
Access to landplot	61%	58%	6%	69%	60%	6%

Note: Chronically poor are households with expenditure less than regional poverty line in all rounds, assuming changing value of theta

As a benchmark, our paper started by absorbing these key channels in a model of restructuring and transition. The model is calibrated with values appropriate to the Russian context. We then looked at the implications for inequality and poverty in the transition. What is predicted is indeed a sharp increase in both inequality and poverty over the course of transition. These results proved to be broadly consistent with the detailed empirical results from our analysis of two large household panels put together from six rounds of the RLMS.

The main results of the empirical analysis were as follows. Using income data for either per capita or households, inequality as conventionally measured has clearly increased. Inequality measures for expenditures are close to those yielded by income data. The upper deciles have raised their shares of total income. There have been major changes in the structure of income; changes that have been larger than the net change in inequality. Public transfers -- but not pensions -- have declined as a share of total income across all deciles. There has been significant growth in capital income, but the largest change has been the decline in the wage share and the rise in income share from entrepreneurial activity and self-employment. This shift in income structure has been widespread across regions and has not been limited to major cities, such as Moscow or St.Petersburg. While changes within components have generally dominated, there is evidence that variation across regions has become progressively more important.

While these changes have been striking, they have not necessarily been permanent. The picture that emerged was of significant mobility across the full panels and across individual rounds. A closer look at groups of stable winners and losers suggested that educational attainment was strongly and positively correlated with success and that differentiation in asset ownership has already begun to emerge.

The paper also examined the incidence and depth of poverty in Russia. We found that at the start of transition roughly half the households fell below the poverty line; an astonishingly high number. Depending on assumptions

regarding household scale economies, the headcount has subsequently fallen substantially. Our estimates of appropriate equivalence scales suggest that by end 1995 the headcount was around 15 percent. - Even so, a clear stratum of chronically poor have begun to emerge. These remain a major challenge for policy.

## Appendix 1

### A Model of Restructuring and Transition with Distributional Effects

The economy consists of two sectors -- state and private -- and three basic labour market states, state employment, private employment and unemployment. The labour force is given by;  $N_1 + N_2 + U = 1$  where  $N_1$  designates employment in the state sector,  $N_2$  employment in the private sector and  $U$ , unemployment.

#### State sector

State firms are governed by a zero profit constraint. With no capital accumulation, we can write the state firm's problem as;

$$\max_{w_1, N_1} \left\{ \frac{N_1 - N_1 V_u}{\bar{N}_1} V_u + \frac{N_1}{\bar{N}_1} V_1 \right\}$$

subject to;  $w_1 N_1 = p_1 Y_1$ .

Output is generated through a Cobb-Douglas function;  $Y_1 = C_1 L^{\beta_1} K^{1-\beta_1}$  where ( $\beta_1 < 1$ ). We assume that the state sector is less efficient in production than the private sector. This is imposed through the production function where the ratio of state to private productivity ( $C_2 / C_1$ ) is set equal to 0.6. Wages in the state sector are set equal to average product, which incorporating taxes per worker implies;

$$w_1 = AP_{1L} - t_1 = \frac{C_1 K_1^{1-\beta_1}}{L_1^{1-\beta_1}} - t_1.$$

#### Private sector

The private sector is characterised by profit maximizing firms. Production is Cobb Douglas. Wages in the private sector are set equal to marginal product which

incorporating taxes per worker implies;  $w_2 = MP_{2L} - t_2 = \frac{\beta_2 \cdot C_2 K_2^{1-\beta_2}}{L_2^{1-\beta_2}} - t_2$ .

Only the private sector hires. Hiring follows;

$$H = \frac{\alpha U N_2}{U + N_2}$$

This says that hiring depends on the ratio of unemployment to private sector employment. The latter serves as a proxy for vacancies. The private sector can thus grow through several channels. The first is, as above, by hiring from unemployment.

The second is through state firms restructuring and transforming. Private sector growth will also, of course, depend on investment.

### Arbitrage equations

The basic arbitrage equations are;

$$rV_1 = w_1 + p_{1U}(V_u - V_1) + p_{12}(V_2 - V_1) + V_1 \quad (1) \text{ Value of being in the state sector}$$

$$rV_2 = w_2 + \beta(V_u - V_2) + V_2 \quad (2) \text{ Value of being in the private sector}$$

$$rV_u = b + (H/U)(V_2 - V_u) + V_u \quad (3) \text{ Value of being unemployed}$$

where  $\beta$  is the probability of job loss in the private sector;  $H/U$  = the hiring rate from unemployment (probability of hiring);  $w_1$  and  $w_2$  are wages in state and private sectors respectively,  $b$  = unemployment benefits;  $p_{1U} = (1 - p_R)p + p_R(1 - \gamma)$  is the complete probability of moving from the state sector to unemployment and  $p_{12} = p_R\gamma$  is the probability of moving from the state to the private sector via restructuring.

From these arbitrage equations we can derive the values,  $(V_2 - V_U)$  or  $V_{2U}$  and  $(V_1 - V_U)$  or  $V_{1U}$  as follows;

$$V_{2U} = (r + \beta + H/U)V_{2U} - (w_2 - b)$$

$$V_{1U} = (r + p_{1U} + p_{12})V_{1U} + (H/U - p_{12})V_{2U} - (w_1 - b)$$

### Balance equations for labour

Collecting the dynamic equations written above, we get the following expressions;

$$\frac{dN_1}{dt} = -(p_{1U} + p_{12})N_1$$

$$\frac{dU}{dt} = p_{1U}N_1 - H(U) + \beta N_2$$

$$\frac{dN_2}{dt} = H(U) + p_{12}N_1 - \beta N_2$$

Summing up the balance equations we get the consistency condition;

$$\frac{dN_1}{dt} + \frac{dN_2}{dt} + \frac{dU}{dt} = \{-(p_{1U} + p_{12})N_1\} + \left\{\frac{H}{U}U + p_{12}N_1 - \beta N_2\right\} + \left\{p_{1U}N_1 - \frac{H}{U}U + \beta N_2\right\} = 0$$

since  $N_1 + N_2 + U = 1$ .

### Balance equations for capital

Total capital in the economy is denoted by  $K$ , with the share in the state sector,  $k_1 = K_1/K$ , and the share of capital in the private sector,  $k_2 = K_2/K$ . When a state firm closes, we assume that its capital also becomes redundant. When a state firm restructures, a part of its capital,  $\gamma_k$ , moves to the private sector and a part  $(1-\gamma_k)$  becomes idle. The dynamics for the allocation of capital are;

$$\frac{dk_1}{dt} = -(\bar{p}_{1U} + \bar{p}_{12})k_1 - \delta_1 k_1$$

$$\frac{dk_2}{dt} = \bar{p}_{12} k_1 + I(k) - \delta_2 k_2$$

where  $\bar{p}_{1U} = (1-p_R)p + p_R(1-\gamma_k)$  and  $\bar{p}_{12} = p_R \cdot \gamma_k$ .

Here  $\delta_1, \delta_2$  are depreciation rates of the state and private capital respectively. For simplicity we set  $\delta_1 = \delta_2 = \delta$ . If depreciation rates are the same for all types of capital, then in the absence of private investment the total stock of capital in the economy decreases with the rate  $\delta$  during the transition. Clearly, it is more realistic to assume that the private sector will invest. To capture this, we have incorporated a private investment function  $I(k)$ ;

$$I(k) = \alpha_k (MP_K^{(2)} - r) \cdot k_2$$

where  $MP_K^{(2)} = \frac{\partial X_2}{\partial K_2}$  is the marginal productivity of capital in the private sector and  $r$  is the interest rate. This function holds for a competitive private sector.

### Taxation and the financing of benefits

Unemployment and its direct cost -- benefits -- has to be financed. We assume that almost all of the costs of unemployment benefits --  $(U-U^0)$  -- are financed through these payroll taxes. For simplicity in the simulations reported in this paper, there is equal incidence across state and private firms (viz;  $\varepsilon = t_2 / t_1 = 1$ )

With these assumptions we have;

$$t = \frac{b(U - U^0)}{N_1 + \varepsilon N_2} = \frac{b(U - U^0)}{N_1(1 - \varepsilon) + \varepsilon(1 - U)}$$

### Closure and restructuring probabilities

Firms face closure and restructuring probabilities. In our framework, insiders in state firms can choose to continue operating subject to some probability of closure, or they can choose to restructure. If they restructure, this will result in a decline in employment, an increase in marginal product for remaining workers and a change in wage setting, with wages now set as in the private sector. Thus, with restructuring, a certain proportion of workers  $(1-\gamma)$  become unemployed, the rest,  $(\gamma)$ , remain in the restructured firm. In the simulations reported in this paper,  $\gamma=0.8$ . A restructured firm is equivalent to a private sector firm. While the initial values for the closure and restructuring probabilities are predetermined in our model and can thus be calibrated, these probabilities are subsequently endogenised by assuming that they depend on the difference between the values of various states. In addition we impose a constraint on each probability and consider the probability of restructuring to be equal to some exogenous value determined by institutional and other factors when there are no benefits to be derived from restructuring ( $V_R < V_1$ ). The probability of closure will be equal to some exogenous value determined by the same factors when ( $V_1 < V_U$ ). With these constraints we have;

$$p = \begin{cases} p^0 e^{-d_1 V_{1U}}, V_1 \geq V_U \\ p^0, V_1 < V_U \end{cases}$$

$$p_R = \begin{cases} p_R^0 + (1 - p_R^0) \cdot (1 - e^{-d_2 \gamma V_{2U}}), V_R \geq V_1 \\ p_R^0, V_R < V_1 \end{cases} = \begin{cases} p_R^0 + (1 - p_R^0) \cdot (1 - e^{-d_2 (\gamma V_{2U} - V_{1U})}), \gamma V_{2U} \geq V_{1U} \\ p_R^0, \gamma V_{2U} < V_{1U} \end{cases}$$

where  $p$  = probability of closure of state firm and  $p_R$  = the probability of restructuring. As above, we denote  $(V_1 - V_U)$  through  $V_{1U}$ ,  $(V_2 - V_U)$  through  $V_{2U}$  and  $(V_R - V_1)$  through  $V_{R1}$  and use the following expression for the *a posteriori* probability of restructuring;  $V_R = \gamma V_2 + (1-\gamma)V_U$ .

### Inequality

Inequality is determined by a combination of within sector inequality given by the coefficients of variation of the lognormal distribution for each sector and between sector inequality governed by the relationships between labour incomes in the sectors. For the former we assume a lognormal distribution which is a normal distribution for the transformed variable,  $\ln(x)$ ,



$$f(x) = \frac{1}{\sqrt{2\pi\sigma x}} e^{-\frac{\ln^2(x/m)}{2\sigma^2}}$$

where  $m > 0$  is the median of the distribution,

$\bar{x} = me^{\frac{\sigma^2}{2}}$  is the mean and

$\sqrt{e^{\sigma^2} - 1} \approx \sigma$  (if  $\sigma \ll 1$ ) is the coefficient of variation.

Within sector inequality depends on the parameters of the lognormal distribution in the following way:

$$T_L = \frac{\sigma^2}{2}, T_E = \frac{\sigma^2}{2}, Gini = \frac{2}{\sqrt{\pi}} \int_0^{\sigma/2} e^{-x^2} dx \approx \frac{\sigma}{\sqrt{\pi}} \left( 1 - \frac{\sigma^2}{12} + \frac{\sigma^4}{160} \right)$$

We have three sets of parameters  $(m_1, \sigma_1)$ ,  $(m_2, \sigma_2)$ ,  $(m_u, \sigma_u)$  and three corresponding inequality measures. More exactly, we assume the parameters  $(\bar{n}, \sigma)$  as given for each sector and the parameter  $m$  of the distribution is derived according to

the formula  $m = \bar{n} e^{-\frac{\sigma^2}{2}}$ .

To calculate total inequality, we can use simple decomposition formulae for the Theil indices:

$$T_L = \sum_{i=0}^2 n_i T_{Li} + \sum_{i=0}^2 n_i \ln(I/w_i)$$

$$T_E = \sum_{i=0}^2 n_i w_i T_{Ei} - \sum_{i=0}^2 n_i w_i \ln(I/w_i)$$

where

$$n_0 = u, w_0 = b, I = u^*b + n_1^*w_1 + n_2^*w_2$$

Alternatively, if benefits are given as a proportion of the average wage, we have;

$$n_0 = u, w_0 = b^*(n_1^*w_1 + n_2^*w_2), I = u^*w_0 + n_1^*w_1 + n_2^*w_2$$

The Gini is not decomposed so simply and a general formula is used;

$$Gini = \frac{\sum_{i=0}^2 \sum_{j=0}^2 n_i n_j \int_0^{\infty} dx \int_0^{\infty} dy |y-x| f_i(x) f_j(y)}{2 \int_0^{\infty} x f(x) dx}$$

where  $f_i(x)$  depends on the average income  $w_i$  in the  $i$ -th sector.

The dynamics of inequality are thus influenced by employment,  $n_i$ , and labour incomes,  $w_i$ , and by income variations in each sector,  $\sigma_i$ . The relative impact of between sector values will depend on a set of -parameters, including relative productivities as well as closure and restructuring probabilities.

### Poverty

The number of poor or headcount in a sector is calculated as following;

$$h_i = \int_0^{P.L.} f_i(x) dx = 0.5 + \frac{1}{\sqrt{\pi}} \int_0^{\frac{\sigma_i}{2\sqrt{2}} + \frac{1}{\sigma_i\sqrt{2}} \ln\left(\frac{P.L.}{w_i}\right)} e^{-x^2} dx$$

where  $x$  is random income in the sector following a lognormal distribution and P.L. is the poverty line.

Values for each sector are generated for the headcount. To retrieve the aggregate headcount, we simply add up the three headcount indices using employment in each sector as weights;

$$Total\ poor = u * poor_U + n_1 * poor_1 + n_2 * poor_2$$

The headcount thus depends on the number of the poor in each sector determined by labour income,  $w_i$ , in the sector  $i$  with respect to the poverty line (P.L.) and the parameter  $\sigma_i$  (approximately equal to the coefficient of income variation in the sector), weighted by employment,  $n_i$ , in each sector. The dynamics of the headcount index are determined by the dynamics of employment,  $n_i$ , and labour incomes,  $w_i$ , and also by the assumptions about income variation in each sector,  $\sigma_i$ .

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