ELSEVIER Regional Science and Urban Economics 32 (2002) 221–239
regional SCIENCE & urban ECONOMICS
www.elsevier.com/locate/econbase

Accounting for growth in post-Soviet Russia

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Received 22 December 1999; received in revised form 29 January 2001; accepted 21 May 2001

Abstract

In pursuit of its transition from a command to a market economy, post-Soviet Russia has witnessed enormous regional differences in economic growth rates. We find that these regional differences exhibit remarkable correspondence with the formation of new legal enterprises. In turn, regional variations in the adoption of economic reforms appear to be an important factor in accounting for regional variations in new-enterprise formation.
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JEL classification: O4; P3; R1

Keywords: ; New-enterprise formation; Regional reform

> . . . the revival of the private sector is among the most important changes that take place in the socialist system during the process of reform (Janos Kornai, 1992, p. 459).

1. Introduction

The economic reforms implemented in post-Soviet Russia have coincided with a surge in the establishment of new private enterprises. These enterprises consist of start-ups and spin-offs from state-owned enterprises. They tend to be small, legally registered, and concentrated in construction, trade, commerce, and small-scale

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PII: S0166-0462(01)00077-1

industry. Kornai (1992) argues that new-enterprise formation is critical for generating growth in post-socialist economies. The crux of his argument is that new enterprises are relatively free of the kinds of distorted incentives that influence state-owned enterprises, and are therefore relatively efficient and responsive to market conditions. Blanchard (1997) notes that by providing expanded employment opportunities, new enterprises better enable politicians to implement efficiency reforms (such as the hardening of state-sector budget constraints) that reduce state-sector employment without losing political support. In addition, Blanchard and Kremer (1997) emphasize the importance of new-enterprise formation in mitigating output reductions resulting from the restructuring and privatization of state enterprises, and breakdowns in the state supply system. Finally, Johnson et al. (1999) show that if new private enterprise property rights are secure, these small enterprises can be an important source of investment through retained earnings.

The purpose of this paper is to quantify the relationship between new-enterprise formation and economic growth at the regional level in post-Soviet Russia, and to explore the influence of various regional characteristics on this relationship. We do this using a data set that measures regional growth in per capita income over the period 1993:IV–1997:IV for 48 regions in Russia; the full data set is described in Section 2 and reported in Tables 1 and 2. Russia experienced considerable regional variation in growth experiences over this period; this variation yields several interesting insights.

Figs. 1 and 2 are suggestive of our main findings. Fig. 1a plots annual average growth rates against our measure of new-enterprise formation (new firms per thousand inhabitants as of 31 December 1995) for our full sample of regions. It also plots the fitted line obtained by regressing growth on a constant and new enterprises. A striking aspect of the figure is the wide range of growth experiences observed in our sample: growth rates ranged from -9 to 15.7% over the sample period. Also notable is the correspondence observed between regional growth and new-enterprise formation. The unconditional correlation between the series is 0.64. Also, the regression coefficient we obtain implies that the addition of a single new small enterprise per 1000 inhabitants corresponds with a 1.07 percentage-point increase in the regional annual growth rate (the coefficient is statistically significant at the 5% level). Fig. 1b plots growth against new enterprises for a sub-sample of our data set that excludes three apparent outliers (Moscow, St. Petersburg, and the oil-rich Tyumen oblast). These regions benefited from unusually high levels of new-enterprise formation, and also enjoyed above-average growth. Their exclusion reduces the unconditional correlation between the series to 0.3, but reduces the estimated regression coefficient only slightly, to 0.83 (the coefficient remains significant at the 5% level).

Of course, the unconditional relationships illustrated in Fig. 1 may be spurious, merely reflecting the joint impact of unmeasured variables on new-enterprise formation and growth. Thus in Fig. 2 we plot the fitted line obtained by regressing

Table 1
Regions included in data set

Capital city	Province	Territory
Petrozavodsk	Karelian Republic	Northern
Murmansk	Murmansk oblast	
St. Petersburg		Northwestern
Kaliningrad	Kaliningrad oblast	
Novgorod	Novgorod oblast	
Bryansk	Bryansk oblast	Central
Ivanovo	Ivanovo oblast	
Kaluga	Kaluga oblast	
Kostroma	Kostroma oblast	
Moscow		
Oryol	Oryol oblast	
Ryazan	Ryazan oblast	
Smolensk	Smolensk oblast	
Tula	Tula oblast	
Yaroslavl	Yaroslavl oblast	
Yoshkar	Mariy-El Republic	Volga-Vyatka
Saransk	Mordovian Republic	
Cheboksary	Chuvash Republic	
Kirov	Kirov oblast	
Nizhniy Novgorod	Nizhniy Novgorod oblast	
Voronezh	Voronezh oblast	Central Black-Earth
Kursk	Kursk oblast	
Lipetsk	Lipetsk oblast	
Kazan	Tatarstan Republic	Volga Region
Astrakhan	Astrakhan oblast	
Volgograd	Volgograd oblast	
Penza	Penza oblast	
Samara	Samara oblast	
Saratov	Saratov oblast	
Ulyanovsk	Ulyanovsk oblast	
Maykop	Adygey Republic	North Caucasus
Nalchik	Kabardin-Balkar Republic	
Vladikavkaz	North Osetian Republic	
Ufa	Bashkortostan Republic	Urals
Izhevsk	Udmurt Republic	
Kurgan	Kurgan oblast	
Perm	Perm oblast	
Yekaterinburg	Sverdlovsk	
Chelyabinsk	Chelyabinsk oblast	
Novosibirsk	Novosibirsk oblast	Western Siberia
Omsk	Omsk oblast	
Tomsk	Tomsk oblast	
Tyumen	Tyumen oblast	
Ulan Ude	Buryat Republic	Eastern Siberia
Vladivostock	Primorskiy Kray	Far East
Khabarovsk	Khabarovsk Kray	
Petropavlovsk	Kamchatka oblast	
Magadan	Magadan oblast	

Table 2
Growth, new-enterprises, initial conditions and regional characteristics

Region	GROWTH (%) (annual, 1993:IV–97:IV)	NEWENT (per 1000 citizens)	INITIAL	IO (%)	DEFENSE (per 1000 employees)	EDU (%)	REF (%)	FINV ($ per capita)
Karelia	−5.47	4.59	3.43	7.16	5.7	12.7	36.2	25.48
Murmansk	−6.10	4.87	3.79	−13.38	4.3	15.0	38.0	2.86
St. Petersburg	1.48	12.31	2.65	7.50	34.4	29.5	54.1	32.70
Kaliningrad	−2.46	4.08	2.46	−28.05	15.9	16.3	30.7	17.17
Novgorod	0.91	4.44	2.51	7.30	39.2	11.5	30.5	33.65
Bryansk	−9.02	2.97	2.66	5.04	36.0	10.8	18.9	2.70
Ivanovo	0.37	3.95	1.75	21.13	1.7	12.3	24.5	0.79
Kaluga	−4.65	5.74	2.74	1.60	46.9	14.6	28.5	0.91
Kostroma	−5.23	3.23	2.56	6.49	13.8	11.7	24.4	0.00
Moscow	15.74	16.61	4.60	8.36	24.4	33.4	57.3	161.36
Oryol	−6.42	2.52	4.04	8.27	13.0	12.7	16.7	19.69
Ryazan	−7.12	3.70	2.43	6.03	27.6	12.6	20.3	1.51
Smolensk	0.60	2.47	2.47	7.66	21.1	12.3	18.9	5.12
Tula	−2.03	3.47	3.06	12.08	33.3	13.0	26.4	7.16
Yaroslavl	−2.02	4.89	2.86	12.66	22.3	13.3	35.2	0.69
Mariy-El	−6.47	2.09	2.63	1.59	45.7	13.0	20.9	1.31
Mordovian	−6.07	1.88	2.00	11.54	15.8	13.4	28.2	2.09
Chuvash	−7.48	3.09	2.16	12.69	19.9	12.0	22.9	0.73
Kirov	−1.50	1.96	2.54	3.79	31.4	10.7	22.8	0.61
Nizhni Novgorod	−2.67	2.39	2.76	11.02	32.4	13.0	31.9	16.10
Voponezh	−2.82	3.08	2.39	−4.11	40.2	14.2	21.3	0.40
Kursk	−5.51	1.71	2.59	0.42	13.9	13.6	14.8	0.74
Lipetsk	−4.70	2.40	3.03	10.42	8.1	11.7	20.4	3.20
Tatarstan	−1.30	4.23	3.36	11.34	30.1	12.5	42.2	42.82
Astrakhan	−2.71	4.18	2.23	−19.56	23.1	12.6	27.1	0.00
Volgograd	2.66	6.14	2.32	10.01	20.9	13.8	27.4	6.66
Penza	−4.60	3.91	2.12	5.11	24.4	11.9	19.0	0.64
Samara	2.35	4.74	2.65	11.79	34.2	15.7	30.1	23.25
Saratov	−5.13	3.80	2.57	6.47	32.3	16.4	21.7	9.86
Ulyanovsk	−0.97	2.54	3.90	8.28	34.2	12.1	16.3	0.00
Adyegey	−7.85	4.00	2.10	16.95	4.0	11.5	18.4	0.00
Karbardin Balkar	0.58	4.05	2.07	3.77	18.7	13.8	33.8	2.53
North Osetia	2.28	2.56	1.87	3.04	33.1	18.7	12.9	0.00
Bashkortostan	−0.96	3.12	2.98	14.00	28.8	10.6	26.1	0.73
Udmurtia	1.76	3.72	2.31	7.25	57.0	12.6	23.9	3.66
Kurgan	−5.02	2.79	1.89	0.83	22.4	9.2	19.2	0.00
Perm	3.80	3.42	2.32	11.96	37.8	11.0	34.5	5.65
Sverdlovsk	0.39	5.08	2.94	16.08	32.5	12.3	34.4	1.92
Chelyabinsk	5.20	3.09	2.22	21.79	22.3	12.0	34.6	6.94
Novosibirsk	1.93	5.20	1.55	0.91	45.3	15.9	26.6	28.74
Omsk	0.87	3.86	3.07	5.45	42.5	13.3	22.5	1.84
Tomsk	−2.46	4.17	2.78	8.27	12.8	18.2	31.0	40.82
Tyumen	4.65	9.40	6.00	15.02	13.2	13.1	27.5	32.49
Buryatia	−4.16	3.89	2.28	4.71	21.8	16.2	21.0	0.95
Primorskiy	−2.25	5.01	1.63	−10.10	15.9	16.4	21.4	23.50
Khabarovsk	−7.12	3.69	2.35	3.77	28.6	18.6	31.5	26.73
Kamchatka	−0.99	7.06	3.24	−71.64	2.5	16.7	40.1	58.39
Magadan	1.95	7.36	3.38	0.62	41.4	16.4	31.3	54.26
Descriptive statistics								
Average	−1.79	4.36	2.71	4.24	25.6	14.3	27.5	14.78
Median	−2.14	3.88	2.56	7.20	24.4	13.0	26.5	3.03
Standard deviation	4.44	2.63	0.79	14.44	13.0	4.2	9.1	26.60
Minimum	−9.02	1.71	1.55	−71.64	1.7	9.2	12.9	0.00
Maximum	15.74	16.61	6.00	21.79	57.0	33.4	57.3	161.36

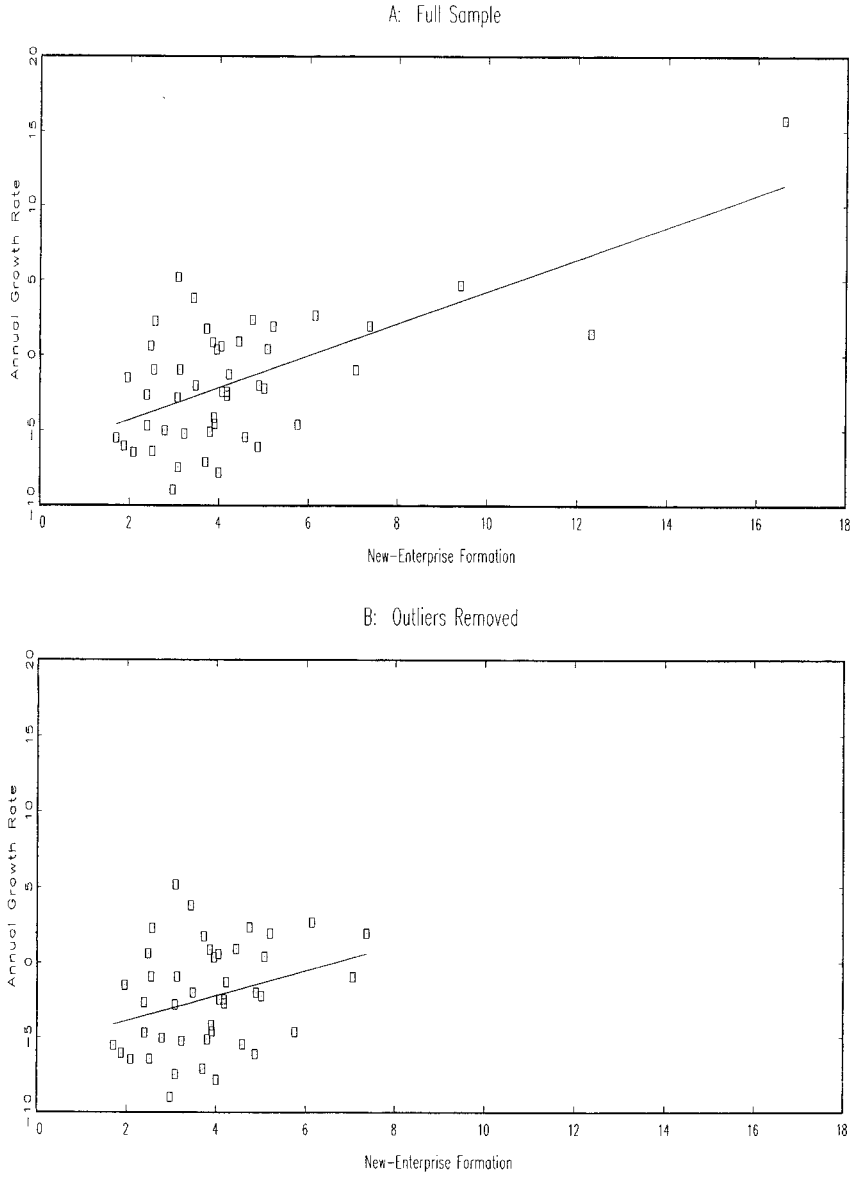

Fig. 1. Unconditional correlations between growth and new-enterprise formation. (A) Full sample; (B) outliers removed.

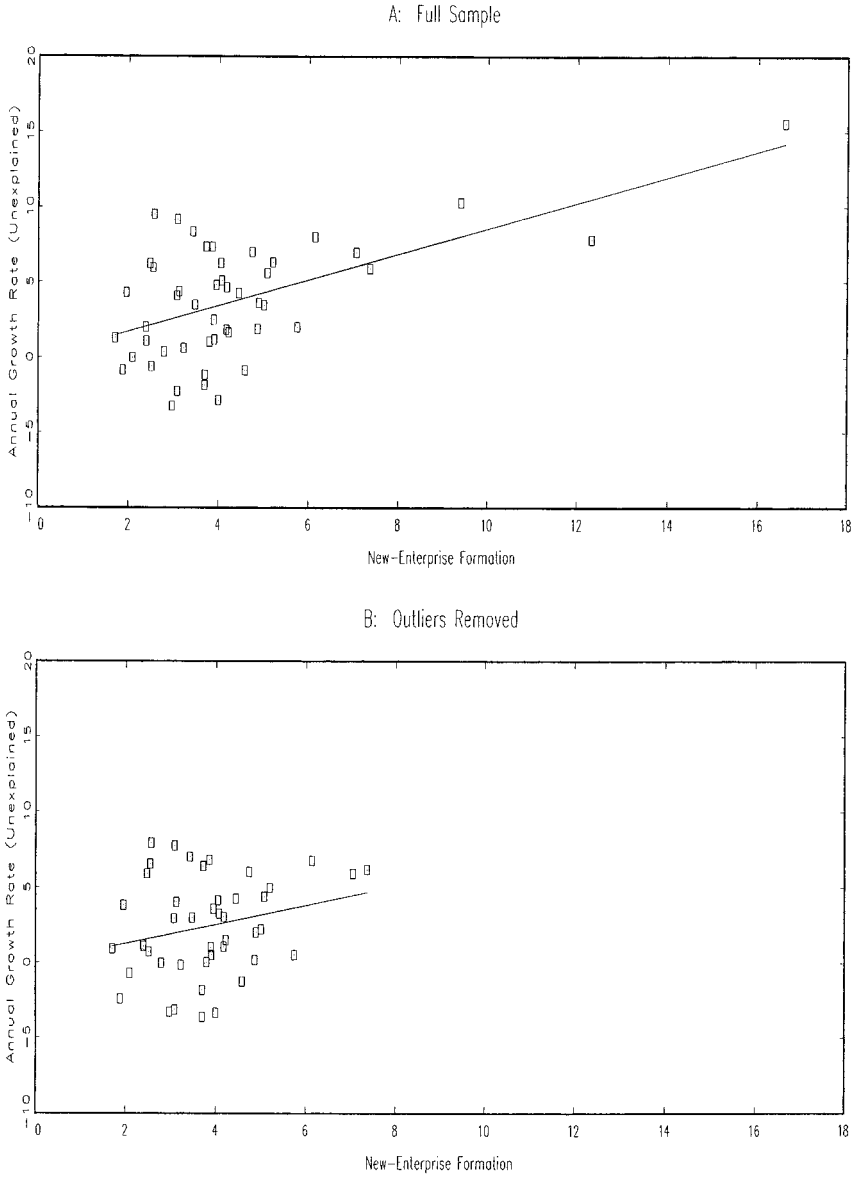

Fig. 2. Conditional correlations between growth and new-enterprise formation. (A) Full sample; (B) outliers removed.

growth on a constant, new enterprises, and the full set of additional explanatory variables contained in our data set. The additional explanatory variables include regional measures of initial income levels, industrial characteristics, education levels, foreign investment activity, and political support for economic reform. Fig. 2a presents the relationship estimated using the full data set; the coefficient we obtain in this case is 0.86 (significant at the 5% level). Fig. 2b presents the relationship estimated in the sub-sample of our data set; the regression coefficient we obtain in this case is 0.63 (significant at the 10% level). The general relationship illustrated in these figures turns out to be robust to a host of considerations outlined below.

If new-enterprise formation has indeed been an important engine of growth in post-Soviet Russia, it is then critical to understand regional characteristics that have influenced this formation. An interesting aspect of Russia's economic transition is that while economic reforms were initiated at the federal level, the implementation of these reforms has differed markedly across regions. We exploit this by analyzing whether regional differences in attitudes towards reform can account for regional differences in growth, and conclude that to a considerable degree, they can. Specifically, regions in which political support for the adoption of reforms has been strong have experienced relatively high levels of new-enterprise formation. In turn, as Figs. 1 and 2 illustrate, new-enterprise formation corresponds closely with subsequent economic growth.

Our specific measure of political support for economic reform is the share of the popular vote garnered by 'pro-reform parties' in Russia's December 1995 parliamentary elections. Pro-reform parties stood for a continuation and deepening of microeconomic reforms, including price liberalization and privatization initiatives. In contrast, significant oppositional political parties had platforms that called for slowdowns in the implementation of privatization initiatives, a return to broad price controls, and in some cases, re-nationalizations (the 'pro-reform' parties are listed in Section 2.2). The use of this measure was inspired by Warner's (1999) finding that voting patterns in this election were heavily influenced by regional variations in the adoption of microeconomic reforms (small-scale privatization and price liberalization); regions that had implemented relatively widespread and deep microeconomic reforms prior to the election subsequently supported pro-reformist parties in the election. It turns out that the marginal explanatory power of direct measures of regional reform adaptation in accounting for new-enterprise formation is minimal once these voting patterns are taken into account; thus these voting patterns serve as a proxy for regional patterns of economic reform in this paper.[1]

[1]We are indebted to an anonymous referee for suggesting the use of these regional voting patterns in our analysis. In previous versions of this paper, we found that direct regional measures of, e.g., price-liberalization and privatization initiatives exhibited close correspondence with new-enterprise formation. The links between new-enterprise formation and growth reported here closely mirror the results obtained using these direct measures.

Recent empirical work on transition in the Former Soviet Union and Eastern Europe has analyzed explanations for differences in economic growth observed across countries. Several studies have emphasized the importance of stabilization (Aslund et al., 1996; de Melo et al., 1996; Fischer et al., 1996; Sachs and Warner, 1996; Sachs, 1997) and other liberalization policies (de Melo and Gelb, 1996; Selowsky and Martin, 1997). Others have emphasized pre-transition initial conditions (Blanchard and Kremer, 1997; de Melo et al., 1997). Finally, Johnson et al. (1997) have emphasized the role of public finances and corruption.

2. Data description

In order to measure regional income growth, new-enterprise formation, initial conditions, political support for economic reform, foreign investment activity and educational achievement, we have compiled a data set that includes regions located in all 11 of Russia's territories. There are 89 regions in Russia, including 21 republics, six krays, 49 oblasts, one autonomous oblast, 10 autonomous okrugs, and two federal cities (Moscow and St. Petersburg). Ideally, we would work with data from all 89 regions. However, we could not obtain complete regional coverage for several of our variables; rather, our sample includes regions in which the capital city comprises at least 30% of the total regional population. There are 48 such regions in Russia, which accounted for 63.2% of the Russian population in 1996. These regions, along with their capital cities and geographic territories, are reported in Table 1.

2.1. Growth and new-enterprise formation

We use real per capita income data to measure growth in regional standards of living (GROWTH). Average regional per capita nominal income and regional consumer price indices are reported on a monthly basis and are available for all regions in our sample starting in 1993:IV. We compute GROWTH as the annualized growth rate of regional per capita nominal income, deflated by the regional-level consumer price index, measured from 1993:IV to 1997:IV. Our measure of new-enterprise formation (NEWENT) is the number of small legally registered private enterprises per thousand inhabitants as of 31 December 1995; it is taken from Goskomstat Rossii (1996). While employment ceilings that define small enterprises vary across industries, the typical small enterprise employs no more than 200 workers. These small private enterprises include privatized former state enterprises, spin-offs from privatized state enterprises, and startups. Legal startups and spin-offs began to appear in the Former Soviet Union in the late 1980s and rapidly expanded when Russia began instituting radical economic reforms in the early 1990s (Aslund, 1997). Thus, NEWENT is intended to capture the regional 'stock' of legal entrepreneurial activity that had been accumulated by

the end of 1995. Note that while there is some time overlap between GROWTH and NEWENT, GROWTH is measured over a time period that extends 2 years beyond the period over which NEWENT is measured.

2.2. Regional reform

In its attempt to transform itself from a socialist to a capitalist system, the federal government of Russia initiated a broad range of reforms, including broad price liberalization and the privatization of state-owned enterprises. But while the federal government initiated these reforms, their implementation has largely been the responsibility of regional governments. As a result, there has been considerable inter-regional variation in the mix of adopted policies (e.g., see Berkowitz and DeJong, 1999; Warner, 1999). For example, the Nizhni Novgorod oblast aggressively pursued privatization during this period, but had a mediocre record in relaxing price controls; the opposite was true in the Tomsk oblast. The Tatarstan Republic moved slowly on price liberalization and privatization while the Saratov oblast moved rapidly on both of these reforms. Finally, local governments within regions varied in the extent to which they participated in small-scale privatization. For example, the local governments in the Ryazan oblast played only a limited role; in contrast, the local governments in the Saratov oblast actively participated in their extensive small-scale privatization.

The literature on the reform of post-socialist economies in the former Soviet Union predicts a positive relationship between the depth of regional reform and regional growth. Shleifer and Vishny (1994), and Boycko et al. (1995) argue that privatization should enhance growth by reducing inefficiencies associated with separation of control and ownership in state-owned firms. Boycko (1992), Murphy et al. (1992), and Osband (1992) argue that broad and rapid price liberalization should also enhance growth and welfare by eliminating distortions such as queuing, black markets, and bribery that arise due to scarcities generated by socialist pricing systems. It can also be argued that there should be a positive association between reform and the growth of new enterprises. Indeed, Johnson et al. (1999) show that in countries in which reforms effectively secure property rights for new enterprises, these enterprises tend to increase the share of their profits set aside for financing investment.

We use the share of the regional population that voted for pro-reform parties in the December 1995 parliamentary elections (REF) as a proxy for regional economic reform. As noted in the introduction, pro-reform parties proposed to deepen price liberalization and privatization policies, while the other significant parties proposed to substantially slow or even reverse these reforms. The categorization of parties as pro-reform draws upon the work of Clem and Craumer (2000). The choice of REF as proxy for regional economic reform is based on Warner's (1999) finding that there is a strong positive relationship throughout Russia between the depth of microeconomic reforms initiated at the regional level

and regional support of pro-reform parties in the 1995 election.[2] As also noted in the introduction, earlier versions of this paper employed direct regional measures of economic reforms; the marginal explanatory power of these direct measures is negligible given the inclusion of the voting data we examine here.

Another proxy for regional reform we employ is foreign investment within a region (again, we thank an anonymous referee for suggesting this variable). This is a potentially good proxy for reform because regions with established market-based laws and clear property rights presumably have a relatively strong ability to attract foreign investment. Aside from its value as a proxy, foreign investment is also potentially important in accounting for growth directly, since it serves as a source of financing for regional capital accumulation. Our measure of foreign investment (FINV) is the sum of foreign direct and portfolio investment in 1995, measured in 1995 US dollars per capita; it is taken from Goskomstat (1999).

Finally, the influence of the federal government through subsidies and transfers to regional governments is a potentially important component of regional economic performance; so too is the influence of regional tax policies. In earlier versions of this paper, we sought to characterize these influences by compiling measures of federal transfers to regional governments (measured as a share of overall regional-government expenditures), and average regional tax rates. These measures turned out to have negligible explanatory power in accounting for regional new-enterprise formation and growth, and thus are omitted here. Their insignificance is perhaps in part due to measurement problems. For example, an ideal measure of regional tax policies would involve marginal rather than average rates, but this information is not generally available. Neither is information on off-budgetary taxes, transfer payments, and bribes, which are potentially important components of overall tax and transfer activities. Thus, an important caveat associated with our findings is that we were unable to compile truly comprehensive measures of tax and transfer activities. On the other hand, if foreign-investment activities are sensitive to regional variations in taxes and transfers, then the inclusion of FINV in our analysis may at least in part compensate for this shortcoming.

2.3. Initial conditions

Our primary focus is on the relationship between regional attitudes toward reform, new-enterprise formation and growth. However, in order to control for the

[2]Warner's analysis is based on the following three reformist parties: Yabloko, Russia's Choice, and Forward Russia. At the aggregate level, these parties garnered 12.9% of the popular vote. To Warner's list, Clem and Craumer add the following parties: Pamfilova, Worker's Self-Government, and Common Cause. At the aggregate level, these parties garnered 6.4% of the popular vote. Thus the six parties combined garnered 19.3% of the popular vote.

influence of other relevant factors, we also consider four measures of regional initial conditions. The first is a measure of initial standards of living.

There is a large literature on the relationship between initial standards of living and growth. For example, Barro and Sala-i-Martin (1992) present evidence of convergence in standards of living across US states. Regarding transition economies, Blanchard and Kremer (1997) make a theoretical argument and provide confirming evidence that the denser were inter-industry flow patterns under socialism, the more disorganization tended to occur during transition as state-sector enterprises were restructured and privatized, and thus the greater were resulting declines in output. de Melo et al. (1997) show that countries that had stronger traditions of market institutions prior to the advent of socialism experienced stronger growth performances during their transitions. Finally, Jefferson and Rawski (1994) and de Melo and Ofer (1999) show that regions within China and Russia with relatively high initial standards of living have tended to undertake relatively extensive economic reforms.

Our measure of initial regional standards of living (INITIAL) is nominal per capita income divided by the cost of the basket of 19 basic food goods in 1993:IV. We divide by the cost of this basket to control for regional differences in the cost of living in calculating living standards. Our measure is based on the earliest available price data that encompass a broad regional consumption basket.

The second regional initial condition we consider is initial production potential (IO), which is measured using data taken from Gaddy (1996). Gaddy reports labor shares employed in various industrial sectors dedicated to the production of tradable goods within each region in 1985. We multiplied these shares by the industry's value added, net of labor costs (intermediate shadow-profit rate), and summed the resulting products to compute IO. These intermediate shadow-profit rates use world-market prices and Soviet input–output tables, and were computed by Senik-Leygonie and Hughes (1992). Thus, our IO measure is a weighted shadow-profit rate. It is worth noting that the oil and gas industries have the highest value added in the industrial sectors, while food processing has the lowest (indeed, negative) value added. IO is meant to characterize the basic industrial structure of the region prior to transition: a high rate indicates the regional presence of relatively competitive industries (e.g., oil and gas production). A priori, we expect this variable to be positively associated with GROWTH.

The third initial condition we consider is the regional importance of the defense industry (DEFENSE) prior to transition. This measure is taken from Gaddy (1996); it is the share of workers employed in the defense industry in the region in 1985. Gaddy argues that the defense industry should have a positive impact on growth because it attracted highly skilled workers and gave regions strong political connections with major power brokers in Moscow. We expect DEFENSE to have a positive relationship with GROWTH, given the relative stability of this industry in an otherwise turbulent economic environment.

The final initial condition we consider is the share of the population 15 years old

and higher as of 1994 that received formal schooling beyond the high-school level (EDU). This measure is taken from the 1994 Russian micro-census (Goskomstat, 1995). The relationship between education and growth has received considerable attention at the international level. For example, in a study of roughly 100 countries observed over the period 1960–1990, Barro and Lee (1993) and Barro (1997) show that years of schooling have a positive and significant impact on growth. Higher education is presumably particularly important in post-transition Russia, since workers were expected to rapidly adjust to massive changes in the way that commerce is conducted. Thus, we expect to observe a positive association between EDU and GROWTH.

2.4. Summary statistics

Table 2 reports our full data set and summary statistics; Table 3 presents correlation tables for the full data set and the subsample obtained by excluding the 'outlier' regions of Moscow, St. Petersburg and Tyumen. Several aspects of Russia's inter-regional growth experience are evident in these tables. First, the overall growth record is poor. In the full sample, only 17 of the 48 regions experienced positive real income growth during 1993:IV–1997:IV; in contrast, 26 had annual growth rates between -2 and -9.02%.

Second, as illustrated in Figs. 1 and 2 and discussed in the Introduction, there is a strong positive relationship between growth and new-enterprise formation. Table

Table 3
Correlation patterns

Variable	GROWTH	NEWENT	INITIAL	IO	DEFENSE	EDU	REF	FINV
Full data set								
GROWTH	1.00							
NEWENT	0.636	1.00						
INITIAL	0.28	0.467	1.00					
IO	0.107	−0.101	0.008	1.00				
DEFENSE	0.215	−0.008	−0.132	0.180	1.00			
EDU	0.488	0.800	0.204	−0.150	0.042	1.00		
REF	0.513	0.738	0.314	−0.116	−0.037	0.620	1.00	
FINV	0.605	0.798	0.466	−0.174	−0.041	0.667	0.737	1.00
Subset with outliers removed								
GROWTH	1.00							
NEWENT	0.301	1.00						
INITIAL	−0.123	0.107	1.00					
IO	0.069	−0.385	−0.109	1.00				
DEFENSE	0.319	−0.006	−0.060	0.200	1.00			
EDU	0.098	0.403	−0.055	−0.384	−0.011	1.00		
REF	0.298	0.550	0.250	−0.205	−0.097	0.151	1.00	
FINV	0.211	0.571	0.272	−0.407	−0.047	0.521	0.472	1.00

3 illustrates that this relationship is stronger in the full sample (where the correlation coefficient equals 0.636) than in the sub-sample (where the correlation coefficient equals 0.301).

The correlations in Table 3 also show that there is a stronger direct relationship between the regional reform measures (REF and FINV) and NEWENT than between the reform measures and GROWTH; this is true in both the full data set and the sub-sample. For example, in the full sample, the correlations between NEWENT and (REF, FINV) are (0.738, 0.798), while the correlations between GROWTH and (REF, FINV) are (0.513, 0.605). As noted previously, a priori, we expect to observe a positive relationship between the reform measures and both GROWTH and NEWENT.

Finally, Table 2 shows that foreign investment (FINV) is small and skewed upwards. In 1995, while the average region attracted only $14.78 per capita, half of the regions received no more than $3.03 per capita. Thus the potential importance of FINV in accounting for growth is presumably limited largely to its value as a proxy for regional reform, since its small size indicates its limited importance as a source of financial capital.

Having summarized general patterns evident in the data, we now turn to a more formal regression analysis.

3. Model estimates

To quantify the relationship between growth and new-enterprise formation, we estimate several variations of the following structural model:

$$\text{NEWENT} = \gamma_0 + \gamma_1\text{INITIAL} + \gamma_2\text{IO} + \gamma_3\text{DEFENSE} + \gamma_4\text{EDU} + \gamma_5\text{REF} + \gamma_6\text{FINV} + e \quad (1)$$

$$\text{GROWTH} = \beta_0 + \beta_1\text{INITIAL} + \beta_2\text{IO} + \beta_3\text{DEFENSE} + \beta_4\text{EDU} + \beta_5\text{REF} + \beta_6\text{FINV} + \beta_7\text{NEWENT} + u \quad (2)$$

This model characterizes GROWTH as a function of all of the variables in our data set, and NEWENT as a function of all of the variables except GROWTH. The exclusion of GROWTH from the NEWENT equation is discussed below. The model is estimated using the full data set, and the subsample obtained by excluding the ‘outlier’ regions. Estimates of (1) are presented in Table 4, and estimates of (2) are presented in Table 5. In all cases, standard errors used to compute t statistics are heteroskedastic-consistent (White, 1980).

Consider first OLS estimates of (1) obtained using the full data set, reported in the first column of Table 4. The fit of the model is impressive: we obtain an R^2 statistic of 0.807, and each of the estimated coefficients is positive. The coefficients estimated for IO and DEFENSE are clearly statistically insignificant in

Table 4
NEWENT regressions

Variable	OLS Full sample	OLS Full sample	OLS Subsample	TSLS Full sample	TSLS Subsample
CONSTANT	−3.869	−3.798	0.488	−2.606	0.602
	(−2.717)***	(−2.768)***	(0.459)	(−1.935)*	(0.536)
INITIAL	0.659	0.665	−0.124	0.660	−0.053
	(1.597)	(1.591)	(−0.667)	(2.208)**	(−0.246)
IO	0.005	X	X	X	X
	(0.618)				
DEFENSE	0.002	X	X	X	X
	(0.190)				
EDU	0.278	0.278	0.117	0.270	0.118
	(4.406)***	(4.403)***	(1.849)*	(3.468)***	(1.776)*
REF	0.077	0.076	0.069	0.058	0.062
	(3.091)***	(3.099)***	(3.163)**	(1.908)*	(2.947)***
FINV	0.020	0.020	0.024	0.005	0.023
	(2.023)**	(1.904)*	(1.747)*	(0.377)	(1.625)*
GROWTH	X	X	X	0.196	0.049
				(2.531)**	(0.747)
R^2	0.807	0.806	0.452	0.812	0.444

All t statistics calculated using heteroskedastic-consistent standard errors (White, 1980). The presence of an X indicates that the variable was omitted from the regression. Significance at the *10% level, **5% level and ***1% level.

this case (their t statistics are each well below one), and this is true in general; thus IO and DEFENSE are excluded in subsequent regressions. OLS estimates of the restricted model are presented in the second column of Table 4. (Note that the R^2 statistic obtained in this case falls by only 0.001 relative to the unrestricted case, and the coefficient estimates are nearly identical as well.) The remaining coefficients are significant both statistically and quantitatively. Specifically, the coefficient estimates on INITIAL, EDU, REF, and FINV indicate that, everything else equal, a one-standard-deviation increase in these variables corresponds with an additional 0.53, 1.2 0.7, and 0.53 new firms per 1000 inhabitants in the region, respectively.

The third column of Table 4 reports estimates of (1) obtained given the exclusion of the ‘outlier’ regions. Three notable differences arise given this exclusion. First, the R^2 statistic falls to 0.452, so there is an appreciable deterioration in fit. Second, the coefficient on INITIAL decreases in absolute value by a factor of approximately 5, becoming negative and insignificant. This indicates that while the ‘outlier’ regions started off relatively wealthy and subsequently experienced high levels of new-enterprise formation, this pattern does not hold in general. Finally, the coefficient on EDU decreases by a factor of approximately 2, but remains statistically and quantitatively significant. The quantitative significance of EDU is in this case on par with REF and FINV, whose coefficient

Table 5
GROWTH regressions

Variable	OLS Full sample	OLS Full sample	OLS Subsample	TSLS Full sample	TSLS Subsample
CONSTANT	−4.871	−6.872	−5.303	−7.165	−7.027
	(−1.440)	(−3.157)***	(−1.972)**	(−3.318)***	(−1.956)**
INITIAL	−0.496	−0.234	−1.024	−0.295	−0.971
	(−0.825)	(−0.377)	(−1.527)	(−0.470)	(−1.396)
IO	0.051	0.053	0.042	0.052	0.050
	(2.025)*	(1.858)*	(1.365)	(1.836)*	(1.490)
DEFENSE	0.070	0.067	0.076	0.066	0.073
	(2.028)**	(1.883)*	(2.192)**	(1.860)*	(2.038)**
EDU	−0.217	X	X	X	X
	(−0.902)				
REF	0.033	X	X	X	X
	(0.380)				
FINV	0.066	0.057	0.041	0.046	0.020
	(2.800)***	(2.290)**	(1.329)	(1.501)	(0.549)
NEWENT	0.836	0.675	0.797	0.824	1.281
	(2.153)**	(2.193)**	(1.921)*	(1.878)*	(1.756)*
R^2	0.525	0.511	0.247	0.508	0.228

All t statistics calculated using heteroskedastic-consistent standard errors (White, 1980). The presence of an X indicates that the variable was omitted from the regression. Significance at the *10% level, **5% level and ***1% level.

estimates are roughly unchanged in this case: a one-standard-deviation increase in all three variables corresponds with approximately 0.5 new firms per 1000 inhabitants in the subsample of regions.

Consider now OLS estimates of (2) obtained using the full data set, reported in the first column of Table 5. The fit of the model is also quite good along this dimension: here, we obtain an R^2 statistic of 0.525. In this case, the coefficients estimated for REF and EDU are statistically insignificant, so they are dropped in subsequent regressions.[3] OLS estimates of the restricted model are reported in the second column of Table 5. As in the case of (1), dropping these variables reduces R^2 only slightly, to 0.511, and leaves the remaining coefficient estimates relatively unaffected. All remaining variables have the expected sign, and with the exception of INITIAL, are statistically and quantitatively significant. Regarding quantitative significance, a one-standard-deviation increase in IO (representing an increase in the weighted industry profit rate of 14.44 percentage points) corresponds with an additional annual growth rate of 0.76%. A one-standard-deviation increase in DEFENSE (representing an additional 13 workers per 1000 employed in the

[3]The coefficient estimated for INITIAL is also insignificant in this case, but turns out to be marginally significant in the subsample of the data set; thus we include this variable in all versions of (2).

defense industry) corresponds with an additional annual growth rate of 0.87%. A one-standard-deviation increase in FINV (representing an increase in foreign investment of $26.60 per person) corresponds with an additional annual growth rate of 1.5%. And remarkably, a one-standard-deviation increase in NEWENT (an additional 2.63 new firms per thousand inhabitants) corresponds with an additional annual growth rate of 1.8%.

The third column of Table 5 reports estimates of (2) obtained given the exclusion of the 'outlier' regions. As with (1), the R^2 statistic is approximately cut in half relative to the full sample, falling to 0.247 in this case. The coefficients on IO, DEFENSE and FINV are roughly unchanged in this case, although the coefficients on IO and FINV are no longer significant at the 10% level (their *P* values are 0.17 and 0.18, respectively). The coefficient on INITIAL increases dramatically in absolute value, to -1.024, indicating a strong tendency towards income convergence among the subsample of regions. Specifically, this estimate indicates that a one-standard-deviation increase in INITIAL (an increase in the ratio of per capita income relative to the cost of the basic food basket of 0.79) corresponds with a reduced annual rate of subsequent growth of 0.8%. Finally, the coefficient on NEWENT increases in this case to 0.797. Thus while the correspondence between new-enterprise formation and growth is relatively high in the 'outlier' regions of Moscow, St. Petersburg and Tyumen, the correspondence between new-enterprise formation and growth is even stronger in the remainder of our sample of regions.

We now turn to two important robustness checks. First, we consider the possibility that our estimates of (2) are plagued by bias arising from simultaneity between new-enterprise formation and growth. To check this, we report two-stage least-squares (2SLS) estimates of (2). To generate 2SLS estimates, we first regressed NEWENT on levels and squares of each of the variables included in (1), and then used the instrumented version of NEWENT in estimating (2). This was done for the full data set and the subsample; the resulting estimates are reported in the fourth and fifth columns of Table 5, respectively. In both the full data set and the subsample, the OLS and 2SLS estimates are very similar. For example, R^2 statistics are within two percentage points in both cases, and all coefficient estimates are within one standard deviation across estimation procedures. However, two differences are notable; each difference appears in both the full data set and the subsample. First, the coefficients on FINV are lower in the 2SLS estimates than in the OLS estimates (the coefficient is cut in half in the subsample), and are no longer statistically significant (although the *P* value in the full data set is 0.133). Second, the coefficients on NEWENT are higher in the 2SLS estimates, increasing from 0.675 to 0.824 in the full sample, and from 0.797 to 1.281 in the subsample. Thus, accounting for potential simultaneity underscores the strength of the relationship between new-enterprise formation and growth.

The second robustness test involves an evaluation of the exclusion of GROWTH from the NEWENT Eq. (1). To test this restriction, we estimated a version of (1)

that was modified to include GROWTH as an explanatory variable. Using levels and squares of each variable other than NEWENT as instruments for GROWTH, we estimated this modification of (1) using 2SLS. This was done for the full data set and the subsample; the resulting estimates are reported in the fourth and fifth columns of Table 4, respectively. In the full data set, the estimated coefficients on INITIAL, REF and EDU are virtually identical to their OLS counterparts, but the coefficient on FINV is reduced by a factor of four and is no longer significant, and the coefficient on GROWTH is positive and significant. However, this result appears to be entirely due to the 'outlier' regions. In the subsample in which the outliers are excluded, the coefficient on GROWTH is four times lower than in the full sample (0.049 compared with 0.196 in the full sample), and is statistically insignificant (with a *t* statistic of 0.747). Moreover, the OLS and 2SLS coefficient estimates obtained for the remaining variables in the subsample are largely unaffected by the inclusion of GROWTH in (1). Most notably, the coefficients on REF, EDU and FINV remain positive and statistically significant in this case, and remain within 10% of their OLS counterparts.

To summarize these results, it is interesting to note from the estimates obtained for the GROWTH Eq. (2) that our measures of regional attitudes towards economic reform and education levels do not correspond directly with economic growth over this period. However, the results obtained for the NEWENT Eq. (1) indicate that these measures do exhibit a statistically and quantitatively significant relationship with new-enterprise formation, which in turn exhibits a strong statistical and quantitative relationship with growth. This indirect relationship between economic reforms and growth was obtained in previous versions of our analysis that employed direct measures of regional policy reforms. As noted above, the reason we dropped these direct measures in this analysis is that their marginal explanatory power is negligible given the inclusion of reformist voting patterns.

4. Conclusion

We have explored the relationship between regional patterns of new-enterprise formation and economic growth in post-Soviet Russia. Our findings lend empirical support to Kornai's (1992) view of the critical importance of new-enterprise formation in generating growth in post-socialist economies. Most notably, we have found that regions in which attitudes towards economic reform are relatively favorable, and in which the population is relatively well educated, have experienced relatively high levels of new-enterprise formation. In turn, new-enterprise formation exhibits a strong statistical and quantitative relationship with economic growth.

At the aggregate level, Russia has experienced a difficult transition to a market-oriented economy. Despite this, there are clearly regions within Russia that

have experienced economic success during transition. Our results suggest that a more widespread adaptation of economic reforms at the regional-government level could hold the key to a brighter economic future throughout Russia.

Acknowledgements

We thank Anders Aslund, Gleb Bylov, Lev Freinkman, Yelena Borisovna Frolova, Clifford Gaddy, Evgeny Gavrilenkov, Timothy Heleniak, Alastair McAuley, Randi Ryterman and especially Nina Chebotarieva for their help with the data used in this study. We also thank Patty Beeson, Olivier Blanchard, Martha de Melo, Richard Ericson, Roger Gordon, John Ham, Steve Husted, Hide Ichimura, Alexei Lavrov, Peter Murrell, John Quigley, Thomas Rawski, Jean-Francois Richard, Thomas Richardson, Andrei Shleifer, Lara Shore-Sheppard, Rick Tannery, Werner Troesken, two anonymous referees, and participants in the 1998 AEA/ACES panel on fiscal federalism in transition economies for many useful comments. For providing financial support, Berkowitz is indebted to the National Council for Soviet and East European Studies (under contracts #807-09 and #811-12); the National Science Foundation (under grant SBR-9730499); and the University Center for International Studies and the Center for Russian and East European Studies at the University of Pittsburgh. DeJong gratefully acknowledges financial support provided by the NSF under grant SBR-9422828. The usual caveat applies.

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