Firm Creation and Economic Transitions

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Working Paper Number 238
July 1998

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July 14, 1998

Abstract

Virtually all industrial countries are experiencing some form of transformation in their economies, from the dramatic move from centrally planned to market economies in East-central Europe, to the rebuilding of the economies in the so-called Rust Belt of the USA, to the efforts by Asian countries to return to their recent high growth levels. The analysis builds on the work of Schumpeter, Hannan and Freeman, and Kornai to develop a picture of an economy as an evolutionary process in which the creation, survival and growth of firms is the key to continued growth. This entrepreneurial activity is vital to successful transformations at critical points when the existing enterprises are not well suited to market conditions – what Schumpeter refers to as creative destruction. This paper uses detailed data on the transitions in the Polish and Michigan economies to present evidence to support these propositions. Showing that the successful transformation of two economies with obvious historical differences both depended upon the creation of new firms rather than on the restructuring of existing firms shows that entrepreneurial activity is a universal necessity.

Key Words: Transitional Economies, Entrepreneurism, Creative Destruction

I. Introduction

Virtually all industrial countries are experiencing some form of transformation in their economies. The most dramatic, and wrenching, of these are the evolution of the formerly centrally planned economies of East-Central Europe into capitalistic market economies. Less dramatic and less traumatic but no less perilous are the efforts of the large industrial economies of the East and West to adapt to an emerging and dynamic global economy. These changes,

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* Forthcoming, ***Journal of Business Venturing***. Sept., 1999.

This research is a joint project of the University of Michigan, Jagiellonian University, and the Polish Central Statistical Office. We want to acknowledge the support from the Charles Stewart Mott Foundation and the Central European University. All opinions and errors are the sole responsibility of the authors.

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occurring simultaneously in different countries with somewhat different trajectories and stories, can be seen to have some common characteristics – the downsizing of traditionally large, dominant, industrial firms; the loss of secure, high-wage jobs, many of which did not require high levels of education or formal training; and threats to the financial security of traditional public sector provided social services. Countries have coped, or attempted to cope, with these transitions in different ways and with different degrees of success. This paper examines the changing economic structure in two different economies and comments on the policies adopted in each as a means to promote and restructure their respective economies.

The two economies are Poland following the liberation in 1989 and the state of Michigan in the United States between 1978 and 1988. These economies offers important contrasts and similarities. The similarities in structure and recent history are presented below. Section II then offers a simple, and brief, representation of the dynamics that describe the evolutions in these two economies. Sections III to V then present some micro-level data from Poland and Michigan that show a consistency with this model and that offer important further similarities as well as contrasts between these two economies. Lastly, we conclude with some observations about the policies that underlay the approach of the pubic sector to the transformations of these two economies.

The Michigan and Poland economies both support the proposition that entrepreneurial activity, defined as the initiation of new, growing economic enterprises, is central to the long term health of a market economy. The growth, and even the stability, of an economy will depend upon the rate at which new firms come into existence, the rate at which they survive and grow to become mature enterprises. New economies, such as in East-Central Europe and illustrated by the Polish case, require a rapid and sustained birth process to build a market economy. Older, more stable economies, such as in the United States and Western Europe and illustrated by Michigan, will require a regular process of births and young growth to replenish their economies. This process must, however, be quickened in times of stress on the older, mature firms. The similarities we observe in these two economies, despite their vast differences on some measures, suggest that the firm creation process must be a core part of any market economy. Table 1 offers some basic comparisons between the economic structures, changes, and conditions in these regions during the period 1977-1995. Where available, data from the United States is presented to help put these locales into a broader perspective.

(Table 1 About Here.)

In contrast to the U. S. both Michigan and Poland in the mid-1970's had much larger proportions of the non-agricultural workforce employed in manufacturing and this labor force was more concentrated in very large manufacturing enterprises.[1] These large manufacturing firms are the types of enterprises that have consistently faced strong competition in the world economy and that have undergone, or are considering, major restructuring in order to become more competitive. The well told story of the downsizing and restructuring of the automobile industry in Michigan symbolizes this process quite well. (We have more on those changes in a later section.) We can see that in Michigan by 1988 employment concentrations in these very large firms had fallen substantially, becoming closer to the U. S. averages. An important part of our descriptive story is this transformation. Our data also suggest that a similar process is underway in Poland as the concentration in large state-owned and collective enterprises is replaced by the

[1] Establishments refer to employment at specific locations within a firm, such as an individual plant or office site. The U. S. Census Bureau maintains data on employment by size only for establishments, not firms. The Michigan and Polish data on size are by firm.

growing number of new private firms. The apparent stability in the proportion of Polish workers in very large manufacturing firms disguises a significant increase in this proportion between 1975 and 1989, followed by a significant decline after the transformation began. To complete the comparisons, Michigan and Poland experienced comparable levels of unemployment at the height of these transitions, both of which were accompanied by serious recessions.

The significant differences between the two economies, of course, is that the basic concepts and institutions associated with a market economy are deeply rooted in Michigan while in Poland they are being created and nurtured as the transition is occurring. These contrasts are easily seen in the differences in the financial sectors of the two regions. Private banks, financiers, accounting firms, financial analysts, auditors, etc. are common part of the Michigan economy, despite the fact that Michigan leaders complained that by U. S. standards the state did not have a set of financial institutions that could serve the needs of an economy trying to stimulate entrepreneurial activity. Relative to the rest of the country Michigan had a fewer banks per capita and far fewer venture capital firms and small business investment corporations (SBIC's). The latter two institutions are seen as particularly important to aggressive start-up firms. Relative to countries such as Poland, however, these institutions and the knowledge they contain are abundant in Michigan. Poland, for example, had virtually no investment or commercial banking system in 1989, no stock market, the first venture capital firm was not begun until 1991, and even by 1995 there were only ten funds all but two of which were concentrated in Warsaw. Given that access to financing and particularly financing geared towards new and risky ventures is vital for entrepreneurial activity, Poland began its transition is a vastly worse position than one finds in Michigan or the rest of the U. S.

II. A Simple Model of Economic Transformation

This section presents a very simple model that disaggregates the composition of an economy into cohorts of individual firms. The size of these cohorts, measured in different ways, is then reaggregated to reflect the size of the whole economy. The dynamics of how an economy changes are then reflected in the composition and evolution of each of these cohorts. The structure and size of the economy depends on three separate activities – the creation of new firms, the rate of survival of these firms, and the rate of growth and size of the surviving firms. These separate effects can be seen in the following definitions and equations. We denote by F_{0s} the number of firms created in year s, which defines a particular cohort of firms[2]; by S_{0s} the average size of the firm in this cohort in its birth year; by F_{ts} the number of firms in that cohort remaining in year t; by S_{ts} the average firm size in year t; by a_{ts} the proportion of the firms that survive from year t-1 to year t; by b_{ts} the growth rate among the surviving firms from t to t-1; and by E_{ts} the total employment in the remaining firms in year t. From these terms we can express the number of firms surviving in successive years and their total employment as,

$$F_{1s} = a_{1s}F_{0s}$$

$$F_{ts} = a_{ts}F_{t-1,s} = a_{1s} \ldots a_{ts}F_{0s} \quad (1)$$

$$S_{1s} = b_{1s}S_{0s}$$

$$S_{ts} = b_{ts}S_{t-1,s} = b_{1s} \ldots b_{ts}S_{0s} \quad (2)$$

[2] Cohorts can be defined as homogeneously as one wants, such as for specific industry classifications, ownership types, method of origin, initial size, etc. For sake of simplicity here we will ignore such disaggregations here and only refer to cohorts by year of birth.

$$E_{0s} = S_{0s}F_{0s}$$

$$E_{1s} = S_{1s}F_{1s} = b_{1s}S_{0s}a_{1s}F_{0s} = b_{1s}a_{1s}E_{0s}$$

$$E_{ts} = S_{ts}F_{ts} = b_{ts}S_{t-1,s}a_{ts}F_{t-1s} = b_{ts}a_{ts}E_{t-1,s} = (b_{1s}a_{1s}) \ldots (b_{ts}a_{ts})E_{0s} \quad (3)$$

The critical part of these equations is that the total employment in any year t for the cohort of firms born in year s depends upon the number of firms and their size in the birth year, and the survival and growth rates in the following years. Changes in any of these terms alters the aggregate size in all subsequent years. Note that total employment in a cohort increases in each year when the growth rate in average firm size exceeds the reciprocal of the survival rate, $b_{ts} > 1/a_{ts}$. The total of firms in an economy at year t is the sum of F_{ts} for every previous year's cohort, $s = 1, 2, \ldots, t$, and the total employment is a similar sum for E_{ts};

$$F_t = \sum_{s=1}^{t} F_{ts} \quad \text{and} \quad E_t = \sum_{s=1}^{t} E_{ts}.$$

This model, and the way we apply it to transforming economies, combines and builds on, several important literatures. Work in Sociology in the past decade has conceptualized the expansion and transformation of individual industries as an ecological process where the critical factors are the births and death rates of firms entering and leaving the industry. (The central early work in this vein was done by Hannan and Freeman, 1989. See Sing and Lumsden, 1990, for an extended literature review.) The only critical extension we make to this work and its ecological metaphor, is that in growing and transforming an economy we are also very concerned with the growth rates among individual elements, as reflected in the distribution of firm size over time. In an ecological sense, this is akin to thinking about the probability of finding a thousand pound rabbit among a cohort of births. Size has generally received less attention than birth and survival from the organizational ecologists. Hannan, et. al. (1990) remarked that, ``...recent research in organizational ecology has emphasized vital rates (i.e. birth and death)....This emphasis may have slighted issues of growth and contraction at the organizational level.'' We do not propose to remedy this situation, but we do make growth and size an important part of our model.

The conceptualization presented here has important roots in economics as well. These go back at least to Schumpeter, who contended that economic development is the ``new combination'' of materials and processes to create new products, production methods, markets, raw materials, or organizations. (Schumpeter, 1934, pp. 65-66.) He also says these ``new combinations are, as a rule, embodied, as it were, in new firms which generally do not arise out of the old ones but start producing beside them; ....'' (Ibid.) Drawing upon Schumpeter's discussion, economists Richard R. Nelson and Sidney G. Winter (1982) argue that economic growth comes through innovation and the creation of new products, markets, methods, and organizations.

Similar structures and propositions modeling the survival within cohorts has been derived from a model of firm behavior that is based on strict profit maximizing decisions coupled with uncertainty and firm heterogeneity. Pakes and Ericson (1989) develop such a model of firm size and exit, defined as employment or sales becoming zero. Their models generate predictions about the evolution of the size distribution of new firms over time and about the relative importance of initial size. They conduct a nonparametric test of the model's propositions that

offers strong support for the basic model. Levinthal (1992) presents a simulation model of profit driven firms with heterogeneous cost functions facing identical product prices. This model is able to generate birth and survival rates that very closely capture the propositions of the organizational ecologists. He does not, however, present empirical support for the model or its parameters.

A few important authors talking about the potential for reforming centrally planned economies focused on a process similar to what we are describing, though without the modeling formalities. (Much of this work was done at a time that most reformers were focused on how to make the large state-owned enterprises more adaptive and efficient and was seen as quite controversial.) As an academic and a policy advisor to the Hungarian government, Janos Kornai (1990) has repeatedly emphasized the significance of creating an endogenous entrepreneurial class. Peter Murrell (1992) also has called attention to the importance of entrepreneurism and pointed out the weakness of transition strategies which channel resources into the reform of existing enterprises at the expense of the nascent private sector. In their recent book on the transformation of the Polish economy, Johnson and Loveman, 1995, focus on the creation and expansion of new firms, though their study focuses on a set of individual firms rather than on the whole economy or on a specific model of the transformation.

The remainder of the paper elaborates the model presented above, concentrating on measuring and examining the birth, survival and growth rates in the Michigan and Polish economies to illustrate how this view of an economy provides important insights into how these two economies are transforming themselves. In the process, we offer substantial empirical support for the contentions of reformers such as Kornai about how a market economy would be built to replace and not just to transform the command one. We will also contend that there are important similarities between this transformation and ones that do, and must, occur in more established market economies such as the United States, as well. We will concentrate on the Polish case as it is closer to the themes in this volume, and briefly use the Michigan case to illustrate the more general process.

III. The Poland Case: 1990-1995

We begin the comparisons with Poland, as theirs is the easiest experience to summarize with the available data. Our work is based on a special database developed in conjunction with the Polish Central Statistical Office (GUS). The key feature of these data is the ability to longitudinally connect individual firms for the period 1990 - 1995. From these data, then we can track the changes within individual firms, and thus provide a detailed picture of these dynamic processes. These data also permit us to identify new firms when they come into the database, to create cohorts of new firms, and then to track the experiences of these cohorts. The major limitations of the Polish data are that they obviously do not measure the activity of non-reporting firms, the gray economy which may be sizable in the transitional countries. More significantly, the data maintained by the GUS do not include any firms with fewer than five employees. This means that the data miss a large segment of the so-called "new" economy. From our standpoint, it also means that our cohorts are made up not of true births, but of firms that have survived long enough to reach this size threshold. As we talk about births in Poland, we need to keep this fact in mind.

Table 2 shows the dramatic downsizing of jobs in the existing economy and the replacement by employment in new firms. The entries in this table separate firms existing in 1990 into several categories, based on their ownership in 1990 and any subsequent changes in that ownership. For example, the rows noted as SOE refer to enterprises that were state-owned in 1990. Those that remain in the state sector are further classed as unchanged. Those that went through some form

of restructurization, and thus appear in our data as new firms, are labeled as restructured. There is also a small set of fully privatized firms in our data, which are shown separately.

(Table 2 About Here.)

There were 4024 state-owned enterprises that started in the state system in 1990 and either were still there in 1995 or had failed completely in that period. These enterprises lost 1,808,800 jobs in this five year period, or 47.1% of their employment in 1990. The 4709 firms that were restructured lost nearly 500,000 jobs, or 39.2% of their employment. Our data identify 856 firms that were fully privatized, and these firms had employment declines of 173,300 jobs, or about 36% of their original size. One should not infer from these results that restructurization or privatization causes better performance, as the restructurization and privatization programs were aimed specifically at the most viable enterprises. The former collective enterprises did not fare much better, and in some instances did worse than the state-owned enterprises. Far fewer of these enterprises were restructured, and those that were not lost over 800,000 jobs, or over 60% of their original workforce.

The existing firms in the nascent private sector have been separated into those with over a hundred employees in 1990 (aka large firms) and those with 100 or fewer (aka small firms). We want to examine each of these groups separately, and shortly we will treat the small firms as another cohort of new firms under the assumption that many of these were started after 1989. The large domestic and foreign owned firms fared about as well as the public sector firms. They lost over 60% of their initial employment, and very few of these firms were able to grow. Combined, the large private firms and the public sector firms lost over 3.5 million jobs, in just five years. These changes set the stage for a dramatic restructuring of the Polish economy. We also show in this table the number of firms started after 1990 and that still existed in 1995, their employment, and whether they were domestically or foreign owned. It is clear from this table that even though we only have data on firms with more than five employees that these new firms constitute the core of Poland's new market economy.

The Birth of the New Economy

The changes in the small private firms shown in Table 2 provide an important initial clue about the restructuring. Nearly twenty percent of the small firms existing in 1990 exhibited employment growth during this period, and these growing firms created over 75,000 jobs. These firms are just the beginning of a remarkable expansion of the private economy through the creation of new firms. Table 3 shows the number of new firms with more than 5 employees appearing each year, beginning in 1991. The group of small firms observed in 1990 is treated as a cohort for purposes of the remaining analysis. The table also shows the average size of these new firms, and the total employment they created in their initial year. These numbers correspond to the terms F_{0s}, S_{0s}, and E_{0s} in the previous section. The number of births declined each year after 1990, until 1995. It is easy to explain these changes by the changes in the Polish macro-economy, which experienced a serious decline in the initial years of the transformation. Inflation was very high, interest rates were exorbitant, and real incomes were declining. By 1995 these factors had turned significantly, suggesting that this process is sensitive to macro fluctuations.[3] But, as we suggest later, the eventual success of the entrepreneurial process may account for the changes in the macro statistics. The average size firm decreased in 1995, indicating that this

[3] Since the central statistical office does not maintain data on firms with five or fewer employees, the large increase in new firms in 1995 really indicates a large increase in the number of firms that passed this threshold in 1995. The large decrease in average firm size further suggests this may be the case. Clearly, some of these firms will have started in previous years, but we can define a cohort of firms based on size in a given year, so this situation does not undermine our approach.

cohort is starting with smaller firms. The question then becomes what their survival and growth rates will be, which we will observe in subsequent years.

(Table 3 About Here.)

Survival Rates

The critical issues for the growth of the economy are the annual survival and growth rates among these cohorts of firms, and whether these rates will sustain continuous aggregate job growth, i.e. whether $a_{0s}b_{0s} > 1$. If this condition does not hold, then the only way to sustain an economy is for there to be a continually large number of births. (This makes the economic process very similar to the survival of an animal species, which must continually have a birth rate that matches or exceeds the death rate.)

Table 4 shows the survival rates for each cohort of domestic and foreign firms. There are two important results evident in this table. One is the significantly and consistently higher survival rates among foreign owned firms. For all cohorts, the foreign firms' survival rate in the initial year is about thirteen points higher than that of the domestic firms. This difference shrinks to about four points in the second year, and has largely disappeared by the third and subsequent years. These differences in the first two years translate into a considerable long run advantage for foreign firms, as these survival rates are multiplied to get the proportion of firms surviving past the second year. It is easy to speculate about the reasons why foreign firms have higher survival rates. Table 3 indicates that foreign firms begin as bigger firms, which gives them a competitive advantage and may contribute to their higher survival rate. More speculative, is the possibility that the foreign firms, because of their ownership, are better capitalized and have deeper pockets behind them. They may also have a larger proportion of imported managers, who are more experienced in managing in a market economy.

(Table 4 About Here.)

The second notable result in Table 4 is the steady rise in the survival rates among each successive cohort. The survival rate among the earliest domestic cohort was less than 50%, which is very low. This rate rises to over 70% by the 1994 cohort. This is surely do in part to the improving economy. But, it may also indicate that Polish entrepreneurs are becoming more discriminating at starting businesses, and better at managing them once they begin. The higher survival rates might be related to the fact that there were fewer firms in each succeeding cohort, but subsequent statistical analyses examining survival rates by voivodship suggests there is no relationship between the density of firms in a cohort and survival rates.

Growth Rates

The last part of our story are the growth rates, measured in employees per firm and by total sales, among the remaining firms in each cohort. Table 5 shows the growth rates in workers per firm. The most striking result here is the constancy of the growth rates among domestic firms for this whole period. These firms grew by just under 50% the first year, and 10% the second year, then by a few percentage points a year thereafter. Foreign firms, on the other hand, exhibited less stable but generally higher rates of growth. We offer the same possible explanations for why foreign firms grew faster than domestic firms as we did for why they have higher survival rates.

(Table 5 About Here.)

When we compare these growth rates with the previous survival rates, we can see that only for foreign firms in most years and only very recently for domestic firms has the combination of survival and growth rates been sufficient to generate net job growth. Table 6 shows the ratio of total employment in the remaining firms in a cohort in year t to the total employment in the

cohort in year *t-1*. Values greater than one indicate growing employment. As indicated, only the initial cohort of foreign firms did not generate an increasing number of jobs. Conversely, among domestic enterprises, only in 1994-95 was there aggregate job creation. The encouraging result, however, is that all cohorts showed growth between 1994 and 1995. This result further implies the importance of the aggregate economic factors and suggests that subsequent years' may also show such growth.

(Table 6 About Here.)

It should be pointed out strongly that the growth and expansion of these new private domestic firms and the performance of the macro economy are not independent events. Some of the latter, such as the effects of stabilization, deficit control, etc. are exogenous but income growth certainly is not. In fact, we contend that the rapid creation of new, successful enterprises is the way to create and to grow the new private economy.

A second way to measure growth is in the change in sales of the cohort's firms. In many ways this is a more important measure, as it assesses the cohort's contribution to the gross domestic economy. Table 7 shows the ratio of total sales in year *t* to total sales in year *t-1* for each cohort. (These data are in real terms, with the national CPI used for deflating.) These data reveal much the same story as we saw with the employment data. Total sales increased for most of the foreign cohorts, and generally did so only for the domestic cohorts in 1995.

(Table 7 About Here.)

The aggregate sales change among the restructured state-owned enterprises from 1991 through 1994 are included in Table 7 for comparative purposes. These cohorts generally began with real sales growth, but after the first year sales consistently declined, and usually by more than did the sales of the private firms. The implication here is that even as these firms were downsizing in employment to increase their efficiency (see Table 2), they were not increasing their real output, measured in sales. These restructured and privatized firms may still employ a significant number of workers and be an important part of the new economy, but they are unlikely to be a source of growth in either sales or employment.

IV. Regional Variations

The Polish case provides an important opportunity to fit the expressions presented above and to examine the local factors associated with higher rates of birth, survival, and growth. We create cohorts of new firms from the annual births in each voivodship, separated by whether they are domestically or foreign owned. (We also treat the small private and foreign firms existing in 1990 as a cohort.) The statistical analysis will make two related points. The first is that we can model the variations in rates over time and across voivodships to better picture factors that contribute to higher rates of births, survival, and growth. The second point is that fit of these statistical expressions suggest this approach offers a useful way to describe the dynamic processes in an economy, as suggested by the organizational ecologists. This analysis will make eqs. 1 - 3 more of a model of economic change than simply a set of accounting equations.

Births and Initial Size

We first model the birth rate, F_{0s}, and the initial size, S_{0s}, as functions of the birth year, 1990 through 1995, and a set of local characteristics. These variables are: the proportion of the workforce in farming; the log of population density and this term squared (the log transformation is used to provide a more uniform distribution so the variable is not simply a proxy for Warsaw, Lodz, and Katowice); the proportion of the workforce employed in large state-owned enterprises in 1990; whether the voivodship bordered Germany or the western Baltic

(the definition of this variable was that all voivodships beginning with Gdansk and extending along the Baltic and the border through Jelenia Gora); the number of bank headquarters per capita; and the number of bank offices per capita. Employment in farming and state-owned enterprises should be negatively related to the growth of the new economy, as they epitomize the old economy and were strongly resistant to adaptation. Voivodships along the Baltic and bordering Germany have a competitive advantage in being closer to growing markets than are areas in the east and south. Increasing density is likely to offer a competitive advantage, at least up to a point, as it allows economies of scale in reaching customers. Beyond some point, however, the relationship likely becomes negative due to increasing congestion and its associated costs.

The relationship between firm births and size the proximity to banking services and headquarters is of particular interest for our work. The availability of banking services is a factor that can be partially affected by public policy decisions. This will be particularly true in the transitional countries, as banking reform and regulation is a critical matter and the decisions made here will influence the degree to which banks are localized or remain large national enterprises. Jackson and Thomas (1995) examine the employment growth among new firms in the United States between 1969 and 1976 at the state level, when there was still considerable variation in state level banking industries. They concluded new and young firms were advantaged by being located in areas with smaller and more localized banks. For older firms, the advantages ran in the other direction. In the Polish case, this would mean that simply privatizing the large national banks would not stimulate firm births as much as a program designed to turn the system of national banks into a more regionally structured system.

Table 8 shows the statistical results. Because the births equation is estimating a count of the number of events per year per voivodship, estimation was done using a negative binomial function.[4] The dependent variable in the size equation is the number of employees per firm for firms started during the years 1990 to 1995. The summary statistics indicate that this model explains a high proportion of the variance in births per capita, with R^2 values of .72 and .92 respectively. (The fit for births was computed by comparing the number of births predicted from the estimated equation divided by population with the observed number of births per capita.) The fits for the size equations are far more modest, ranging from .08 for foreign firms to .24 for domestic firms.

Most of the explanatory variables are strongly related to birth rates. (We display the minimum and maximum value for each explanatory variable in Table 8 to provide a measure of the range among voivodships.) The coefficient on the log of population in the births equation is virtually one in the domestic model and slightly less than one in the foreign equation. Likelihood ratio tests of the hypothesis that the coefficients on log(Pop) equal one gave Chi-squared values of .37 and 1.54 for the domestic and foreign equations respectively, suggesting that we cannot reject this proposition at anywhere near the conventional thresholds. These results suggest that births per capita do not vary with the population of the voivodship. The following discussion will refer the birth rate, defined in per capita terms, rather than to the number of firms likely to be created.

[4]The negative binomial is a generalized version of the poisson model. Its advantage over the poisson is that the function allows for situations where the variance of the observed events exceeds that of the poisson distribution, which is what we observe. The α parameter estimates the degree to which the model deviates from a poisson, which is implied by $\alpha=0$. The results strongly indicate that the process does not fit the poisson distribution, the values for α are significantly greater than 0, though not large in absolute terms. The estimates were statistically identical to equations where the dependent variable is the log of births per capita, but the negative binomial event count model ought to be a better description of the process we are modeling so it was used.

(Table 8 About Here.)

Birth rates decrease with the proportion of the workforce in agriculture and in large state-owned enterprises, as expected. Births also increase with density, up to a point and then decline. The peak is at a density of about 230 people/km^2, which closely corresponds to the density in Bielsko-Biala. (The next highest density is Kraków, with about 380 people/km^2.) Births were higher, other factors being equal, in the voivodships bordering Germany and the Baltic than in other regions, again as expected. Domestic births declined during the early 1990's, recovering and increasing only in 1995. Foreign births followed a similar but more erratic pattern.

The interesting results are the estimated relations between domestic and foreign births and the density of bank headquarters and offices. The headquarters variable is strongly related to both domestic and foreign births while the bank office variable is not related to either. The bank headquarters coefficient in the foreign equation is much larger than in the domestic equation, but that is largely a consequence of the functional form of the negative binomial equation, meaning that the coefficient is effectively measuring the proportional increase in the number of births for a unit increase in the number of bank headquarters per million population. Because the average number of foreign births is so much smaller than the average number of domestic births (as seen at the bottom of the table), the larger proportional increase does not translate into a larger number of total births. The coefficients estimate that a unit increase in the bank headquarters is associated with a 3.2% increase in the domestic birth rate and a 13.8% increase in the foreign birth rate. For a voivodship with the average number of births, these ratios translate into 9 new domestic and 2 new foreign firms each year.

It is important to compare the estimated relationship between births and bank headquarters with that between births and bank offices. The latter relationship is virtually nonexistent. A unit increase in bank offices per million population is associated with a .11% decrease in the birth rate of domestic firms and a .26% increase in the birth rate of foreign firms. These results imply that it is not just access to banking services that are important in stimulating and nurturing new births, but access to bank headquarters where decisions are made and where financial expertise resides. We refer to stimulating and nurturing births, particularly for the domestic firms because of the nature of the database. Recall that only firms with five or more employees are included in these data, so that by the time we identify a firm as part of a cohort, it likely has been existence for at least a short period and likely experienced some small amount of growth.

The variations in initial size do not exhibit the systematic regularities that we saw in the births data. The size of domestic owned firms was smaller in more agricultural areas, but did not vary with population density, proximity to Germany, or with the concentration of state owned enterprises. Among foreign owned firms, several of the previous patterns were reversed. Firms in agricultural areas were bigger and size decreased with density up to about 250 people/km^2. We do not have a ready explanation for these reversals, though it might well have to do with the types of establishments foreign firms were opening in Poland.

The relationship between the size of domestic firms and the presence of bank headquarters and offices follows what we observed above, though the relationship is smaller. A one unit increase in the density of bank headquarters increases the size of the average new firm by a third of a worker. Again, there is almost no relationship between initial size of domestic firms and the presence of bank offices. The initial size of foreign owned firms is unrelated to the presence of bank headquarters and offices. The relationship with headquarters was positive but very small while the relationship with offices was negative but statistically insignificant.

Two interesting relations are those between the initial size of firms and the density of new firms. The higher the density, the smaller the initial size. For every one hundred new firms per million

people, initial size decreased by about 1.4 workers per firm. This result is not statistically significant for foreign firms, however. These results maybe the result of a stochastic firm generation process. If we think there is a probability density function in each voivodship of the number of potential firms of a given size and that latently larger firms are more likely to come into existence, the higher density of new firms suggests more draws from this size distribution, leading to more smaller firms in a given year. This stochastic result may also indicate a certain type of contagion process, whereby if people see others starting businesses, they may be encouraged to begin one of their own, encouraging the entry of some smaller firms.

Regional Variations – Survival and Growth

The second part of the analytical model shown earlier is the process of survival and growth among the members of these cohorts. The same variables used to model births rates and initial size are used to model survival and growth. The only additions to the model are an exponential term measuring the age of the cohort and lagged values for the number of surviving firms and size, respectively. If we denote the vector of exogenous regional variables by X and the set of yearly dummy variables for 1992 to 1995 by Yr, the estimated equations are:

$$F_t/F_{t-1} = (XB + YrD + A_1 \text{Age}^{A_2})F_{t-1}^{\alpha}, \text{ and}$$

$$S_t/S_{t-1} = (XB + YrD + A_1 \text{Age}^{A_2})S_{t-1}^{\alpha}.$$

Our first expectation is that survival rates will increase and growth rates will decrease with age, though we expect these age effects to diminish over time, hence the exponential term in Age. These expectations imply that A_2 will be negative in both equations and that A_1 will be negative in the survival equation and positive in the growth equation. Second, we want to test the proposition that survival rates vary with the number of firms. If they decrease, it suggestions a congestion effect, with the increased competition decreasing the number of firms surviving. An increase in survival rates suggests an agglomeration effect, where a larger number of new private and foreign firms increases the success of other firms. The lagged size variable tests the proposition that growth *rates* decrease with size, independent of firm age. (Hannan, et. al., 1990.)

The estimated equations are shown in Table 9.[5] The equations for domestic firms explain a considerable amount of the variation across years and regions, with R^2 of .82 and .64 for survival and growth respectively. In addition, the coefficients have relatively small standard errors, suggesting that we have fairly reliable estimates of the underlying relationships. The equations for foreign owned firms, by contrast, seem relatively unreliable. They explain only a small amount of the overtime and cross-sectional variation, with R^2 of .35 and .28, and the coefficients in the growth equation appear to be particularly suspect, given the size of their standard errors. This overall result is very likely the result of the small size of each cohort of foreign firms. The mean size of each foreign cohort was only 12 firms, and ranged from zero to 267. (If Warsaw is excluded, the largest cohort is only 74 firms.) Such small cohorts make systematic evaluations of survival and growth rates quite difficult and subject to substantial idiosyncratic events, despite the weighting of each estimation by the size of the cohort. By contrast, the average size of the domestic cohorts was 240 firms, with a range of 32 to 1570 (1333 if Warsaw is excluded). These sizes are enough to provide reliable estimates, particularly since the domestic cohorts are very likely to be more homogenous than the foreign owned cohorts.

(Table 9 About Here.)

[5] Because the survival and growth equations are non-linear in the parameters non-linear least squares was used to obtain the estimates shown in Table 9.

The dominant relationships are those relating survival and growth rates to the current year, as indicated by the coefficients on the year variables, and the age of the cohort, as revealed by the coefficients A_1 and A_2. The expected survival and growth rates for 1991 are incorporated in the constant term and the year coefficients indicate how rates in the respective year compare to 1991. Survival rates for domestic and foreign firms effectively increased or were constant from year to year between 1991 and 1995. Interestingly, the yearly changes were very comparable for domestic and foreign firms, though foreign firms began with a much higher survival rate, as indicated by the higher constant term. Others things equal, annual growth rates among domestic firms increased after 1991, and were relatively constant after that. Annual growth rates of foreign firms are substantially greater after 1991 but are fairly erratic year to year.

Annual survival and growth rates change substantially with the age of the cohort, particularly for domestic firms. The survival rate for domestic firms is lower by .25 in the first year and by .025 in the second year than in subsequent years, while the growth rate is higher by .50 in the first year and by .047 in the second year. For foreign firms, the survival rate is lower by .10 in the first year than in subsequent years.[6] Only for the growth of foreign firms did the cohort age effects persist for a number of years, slowly declining from 1.2 in the first year to .09 in the fifth. Given the relative unreliability of the whole foreign growth equation, this result should be taken cautiously.

There is no evidence of congestion or crowding effects on survival, and among foreign firms there may be a very small agglomeration effect. The coefficient on the number of domestic firms is effectively zero while that for foreign firms is very slightly positive and statistically significant at the 5% level. This means that for domestic firms, survival rates in a given year are independent of the number of firms in the cohort in that year. For foreign firms, the proportion surviving increases slightly with the number of firms. In the growth equations, the coefficients on existing size indicate that the larger the firm, the smaller the growth *rate*, as suggested by Hannan, et. al. (1990), and this decline is slightly greater for foreign than for domestic firms.

There were very few significant relations between survival and growth and regional characteristics. For the survival of domestic firms, one could very reliably omit these variables from the equation.[7] The only regional variables with a consistent relationship with survival and growth are the density variables. In the domestic growth equation there is a very small relationship, with growth rates declining by .07 from the least dense to a medium dense voivodship, and then rising by the same amount for the densest region. This is a minimal relationship, and consistent with the statistical results suggesting that the exogenous variables only weakly important statistically. For foreign firms, the relationship is virtually negative and monotonic, as the minimum point in the quadratic is very close to the highest density. Both equations show a substantial decrease in survival and growth with density. (Note that in Table 8 we saw a similar relationship between density and initial size.) Other than the density effects, it seems safe to conclude that survival and growth rates very slightly, at best, among regions and then only for foreign firms.

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[6] For foreign firms, this cohort age effect on survival is only evident in the first year. The reason the attempts to estimate the parameter denoted by A_2 failed is that there are no statistical differences in survival rates after the first year. Thus A_2 could take on virtually any value, so long as it was large and negative.

[7] The value of the F-test for omitting these seven variables was only .63, indicating it is very unlikely that we would reject the null hypothesis that these coefficients are zero. Only for the survival equation for foreign firms would be unambiguously reject this hypothesis. For the domestic growth equation, the F-value is 2.51, which suggests we should not reject the null hypothesis, but we also cannot place a lot of confidence in the alternative outcome.

These statistical results reveal several important conclusions. Substantively, the key to the entrepreneurial process on a regional basis is the birth process itself. We saw substantial regional variations in birth rates related to a number of local variables, such as farming, population density, the presence of large state-owned firms, and access to bank headquarters. These variables played a much smaller role in the survival and growth process. Thus, if authorities in Poland want to debate a regional growth policy, it should focus on getting new firms started and through the very early stages. The relationships between births and the presence of bank headquarters suggests that officials debating banking reform and regulation should heed its consequences for firm creation.

Although we did not have the opportunity to pursue the point here, other work suggests that there are important local contagion effects to this process, whereby regions that already have a large number of private firms or are adjacent to areas that do will have a higher birth rate. (See, Arthur, et. al., 1987 for a theoretical argument on this point, and Arthur, 1990, Jackson and Thomas, 1995, Jackson, et. al., 1996, Krugman, 1991, and Nowak, et. al., 1994, for empirical support. The Jackson, et. al. and Nowak, et. al. apply specifically to Poland.) If these contagion effects persist for any length of time they imply that any regional policy must also focus on areas proximate to current success and that efforts to transplant the entrepreneurial process to more remote areas is not likely to be very successful.

Methodologically, the results lend important validity to the simple model outlined in the early section. The birth, survival and growth rates of new firms, particularly for the domestic firms, fit this model quite well. Thus, both the descriptive data presented in the previous section and now the statistical results imply strongly that the transformation and regeneration of an economy depends on this ecological process, fitting our metaphor of the forest.

V. The Michigan Case: 1978 - 1988

We next consider the substantial changes that occurred within this industrial economy during the 1980's. Michigan's economic transformation after 1978 permits an important comparison and contrast with the Polish case. As shown in Table 1 there were important similarities between the two economies in the late 1970's. Table 1 and recent economic performance suggests the Michigan economy has changed considerably since those years. If entrepreneurial activity is the key to the transition of this very industrialized and obviously capitalist economy that is part of a very advanced democratic society, as we will contend, it will establish the broader validity of our claims to the centrality of this process to a successful market economy.

As indicated in Table 1, Michigan had what is easily characterized as a mature industrial economy by the end of the 1970's. So mature, in fact, that it came to symbolize the derogatory term "Rust Belt" economy. The common image of what happened to this economy is epitomized by the automobile industry, and in particular its three major firms. Confronted by strong competition from Japanese producers, these firms lost considerable market share, appealed to the governments for bailouts and protection, and finally they dramatically restructured their organizations, became more innovative and efficient, and recovered as much smaller firms. The structure and behavior of the automobile assembly industry up to the mid-1980's offers fascinating parallels with the Polish state-owned enterprises and strongly suggests that market structure and competition, not ownership, are the keys to a robust and dynamic economy. This story was not limited to the automobile industry, but occurred throughout the economy.

We are fortunate in having a longitudinal database for the state of Michigan that is similar to what we used to analyze the Polish transition, only better, because the Michigan data encompass

a larger share of the regional economy.[8] First, the very small firms are not excluded, so we have a truer picture of births. Second, although there is certainly non-reporting among the smallest firms, the gray economy is not the size, or problem, in Michigan that it is in Poland. Lastly, here we have the advantage of a much longer time series with which to examine the transformation and to test the applicability of the ecological model.

Table 10 shows what happened to the Michigan economy between 1978 and 1988, disaggregated by firm size and for manufacturing separately. We also show what happened to the very large firms with and without the three major automobile companies to reinforce the point that they were not the only sector of the economy experiencing significant restructuring and downsizing. This table reveals several interesting patterns. Quite obviously, very large manufacturing firms shed an enormous number of jobs in their restructuring process. As significantly, these losses were not offset by any significant job gains among these firms. Very large manufacturing firms only created 21,300 gross new jobs during this eleven year period. Very large enterprises in all sectors created fewer than 100,000 gross new jobs.

(Table 10 About Here.)

The set of very small firms, those with twenty of fewer employees in 1978, showed the most change, both in terms of jobs gained and lost. This was particularly true outside manufacturing. What we shall see shortly is that this reflects a large amount of firm birth and death. The likely scenario is that a large number of the firms in this size group in 1978 were relatively new firms, many of whom did not survive over the next ten years, accounting for the large job loss.

The final point evident in Table 10 is the very large number of jobs created in firms born between 1979 and 1988. This is particularly true outside manufacturing, though even there new firms added almost 100,000 jobs to the economy, during a period that many were saying that manufacturing was dead. The nearly 480,000 jobs in new firms helps explain the shift in the proportion of the Michigan workforce in large organizations (though many of these new firms were no longer small by 1988). That 80% of these jobs were created outside manufacturing further explains why the concentration of Michigan's workforce in manufacturing declined and was approaching the national average.

The Birth of New Firms

Table 11 shows for each annual cohort the number of firm births, their average size, and the total employment in the cohort. In studying the births, and cohorts, of firms in Michigan we stratify births into those that had five or fewer employees in the first year that we observe them and those that had over five. One important reason for this stratification is that the larger the firm in its initial year, the less likely it is to be a birth and the more likely it is to be a newly opened branch of a firm existing out of state or a newly relocated enterprise from outside the state. For the purposes of modeling birth cohorts, we want to distinguish these different types of "new" firms. A second reason for the stratification is that it makes the Michigan data more comparable to the Polish data, which excluded the very smallest firms.

(Table 11 About Here.)

[8] The Michigan data are developed from the ES-202 reports that individual firms are required to file on a quarterly basis. Only farmers and railroads are excluded from reporting. The data are then aggregated to create an annual time series. A firm that existed for any quarter of the year is treated as if it existed in that year. This creates a subsequent measurement problem when we try to estimate survival rates, and will be corrected in subsequent work.

There are several interesting and important comparisons in these data with the Polish data. The birth rates in Michigan follow the macro economy but with a lead, particularly on the recovery side, as they did in Poland. The sharpest decline in the Michigan birth rate occurred in 1980, which marked the beginning of the state's depression. The rates then picked up markedly in 1983 and 1984, which leads the state's recovery. They dropped off again in 1988, but we have no way of knowing if that begins a longer term decline or is a one year drop.

The relative birth rates in the two countries are hard to compare, as the appropriate denominator, such as population, workforce, or number of existing firms is not obvious. Poland's population is about five times that of Michigan, which means that on a per capita basis Poland was producing more new firms than Michigan in the over five category, where Poland had about seven times the number of new firms as Michigan. This is significant as a country trying to move from a centrally planned to a market economy needs a higher rate of births than one trying to restructure an existing market economy. What we need to know is the rate of firm creation in Poland in the very small category to get a more meaningful comparison. The average size for the new firms in the over five category, which corresponds to the Polish data, is very slightly lower than that observed for Poland domestic firms, which were generally in the low twenties.

Survival and Growth Rates

Instead of reporting the annual survival and growth rates for each cohort, a space consuming task with nine cohorts, we have averaged these yearly rates for each cohort, which are reported in Table 12. (These data include manufacturing, services and wholesale and retail..) The unexpected result here is the drop in the survival rate in the second year relative to the first year. This may indicate that firms, once started, tend to persist for more than a year before failing. As suggested in a previous footnote, however, this result may be a consequence of aggregating data on an annual basis. Firms that begin in the latter part of a year may survive for less than a year, but their existence would still be recorded in the second year, and their demise would not be recorded until the second year. (The move to quarterly data would remedy this problem.)

(Table 12 About Here.)

Other than this anomaly there are no surprises in these data. The smaller beginning firms have lower survival rates but higher growth rates among the surviving firms than do the larger firms. The lower survival rates are expected, as they are likely to have less of a base from which to absorb any adverse events. The higher growth rates are likely the result of capturing economies of scale. Surviving small firms are likely to have found a successful strategy, either in terms of product, market, production methods, etc. that they can exploit and expand to something closer to the average size for their particular sector. For the smallest firms, annual growth was over thirty percent in year one, about twenty percent in years two and three, and in the mid-teens for the next several years. These rates aggregate to a 322% growth rate in average firm size over the first seven years. In terms of total job growth, which considers both the survival and growth rates, these average rates predict a 16% increase in total employment by year seven of a cohort of small firms. By contrast, the cohorts of firms with larger initial size actually lost total employment over the first seven years of the cohort's life despite the higher survival rate because the growth rate was too small to offset the failure rate. The expectation is that total employment after seven years will be 16% lower than in the initial year of the cohort.

There are important comparisons with the Polish data. The first is the significantly higher survival rates in Michigan in the first several years compared to either the domestic or foreign firm cohorts. The Michigan rates for the group of larger births are close to .88 for the first five years. This implies a five year survival rate of just over fifty percent. The Polish rates were not as steady as the Michigan rates, but the low survival in the first year substantially depresses the

long term rate. Polish survival in 1995, for all cohorts except the youngest one, all exceed the Michigan rate. In the older years, the survival rates are close to .9 in Michigan. (The rates for years eight and nine should be viewed cautiously, as they are only based on two and one cohorts, respectively.)

The Michigan growth rates are substantially lower than those in Poland, particularly for cohorts with comparable initial sizes. For domestic firms, the Polish growth rates averaged about forty-five percent the first year and about ten percent the second year before falling to a rate comparable to what is observed in Michigan. Foreign owned Polish firms had growth rates about sixty-five percent the first year, thirty-five percent the second year and fifteen percent the third year. Again only this last year is comparable to Michigan.

The implications of these results for thinking about economic transformations, even in advanced economies are striking. They are dramatically consistent with Schumpeter's classic statement about creative destruction and his prediction that new economies must grow up along side and possible replace older economies. The restructuring and restoration of the Michigan economy happened because of the creation of a large number of new and successful enterprises, both in manufacturing and in services. These new firms in effect created a "new" economy accounting for a substantial restructuring, with employment in large manufacturing firms being replaced by employment in smaller manufacturing and service firms.

VI. Poland & Michigan: What Can We Learn?

There are a number of useful comparisons between the results observed in Poland and in Michigan. The first is our belief that the results, combined with the simple model outlined in Sec. 2, provide some important insights into how economies are transformed, as well as how they must function in "normal" conditions. There must be a continual generation of new firms, just as any biological entity, be it a forest or an animal species, must continually reproduce itself. During periods of enormous transition, such as is occurring in East Central Europe, this entrepreneurial process becomes even more vital. Identifying this process as the key to a successful transition, and to stimulating job creation in any economy, helps point to specific areas where policies and actions might directly bring about faster change and growth. A focus on entrepreneurial activity should also help governments and private organizations from promoting policies that restrict this process.

The relations in. eq. 3 convey one very important implication. Modest increases in the annual survival or growth rates have very large impacts on job creation, or any other measure of aggregate growth, in the long run. The effects are similar to what we observe with compound interest because the annual rates are multiplied over the life of the cohort. This means that in the long run, any annual increase is equivalent to taking that proportion to some power in estimating the long run effect. For example, a five percent increase in either of these annual rates amounts to over a twenty-five percent increase in total jobs after five years and over a sixty percent increase over ten years.

This implication of the model leads to an important observation on the differences between Poland and Michigan. The largest differences between the Polish and the Michigan economies are in the early survival rates among domestic Polish firms relative to what was observed in Michigan. (See Tables 4 and 12.) These low early survival rates in Poland severely limit the amount of total job creation. We can illustrate this importance by simulating the growth of the domestic private sector using eqs. 1 - 3, but with the Michigan survival rates for a cohort of births that is comparable to the Polish data. This simulation indicates that with the higher survival rates, there would have been an additional 353,000 jobs by 1995, 1.60 million as opposed to 1.25 million, an increase of 28.5%. We do not want to imply that Poland's survival

rate should have or could have been this high, but simply want to use the analysis to suggest the power of shifting some of these rates up.

The statistical results in Tables 8 and 9, along with other evidence, suggest ways to increase these birth, survival, and growth rates. The equations show large regional variations in birth rates, suggesting that policies to stimulate entrepreneurial activity will have to be developed and implemented on a local level, taking local conditions into account. What may help stimulate people to start and growth firms in a rural area is likely to be quite different from what is needed in highly urban areas, to offer one difference. One of the strategies adopted in was to strongly encourage local non-governmental organizations to develop plans to stimulate entrepreneurial activity. (For a discussion of the range of tactics tried in Michigan see Jackson, 1988.) One important consequence of promoting these activities at the local level is that it educates people about the importance and opportunities for starting new firms.

The focus on local initiatives and activity quickly leads to the need to insure there are private financial institutions located at the local level that are prepared to and have the knowledge to underwrite new and risky enterprises. An earlier paper using U. S. data suggested that the need for local financial institutions is driven by information limitations that inhibit larger and more remote institutions from knowing about and servicing entrepreneurs. (Jackson and Thomas, 1995.) Our results in Table 8, if corroborated by additional research in Poland, reinforce these findings. These limitations create the need for policies and regulations that encourage local financial entities that will profit from investing in entrepreneurial activity. Michigan leaders, for example, made the development of financial organizations oriented to new and small enterprises a central part of their economic development strategy because evidence made it clear that the existing institutions were heavily concentrated in sectors that best served the older and larger manufacturing businesses. (See Jackson, 1988.) Financial institutions are highly regulated organizations in virtually all countries, making it imperative that policy makers have a clear understanding of the role of entrepreneurial activity and how that activity is affected by the structure of financial institutions. These public policies are particularly important in the transitional countries where banking reform and the limited experience in managing private financial institutions are major issues. In suggesting the need for local financial institutions with the ability to service new firms we are *not* advocating unprofitable subsidies just for the sake of subsidizing small business.

Informational and educational activities at local levels are likely to have substantial payoffs. Information is needed about the need for entrepreneurial activity, about its benefits both for individuals and for aggregate economies, and about the amount that is already underway. Educational efforts to provide people with the knowledge and motivation to become entrepreneurs are a very important function. Poland is certainly seen as one of the major success stories among the transitional countries, largely as we argue because of its level of entrepreneurial activity, say in contrast to parts of the former Soviet Union. We contend that one important factor accounting for these differences is the climate supporting entrepreneurs and entrepreneurial activity in Poland relative to these other countries. Recent survey data done in Poland, Ukraine, and Russia and earlier in the United States show that on basic attitudes towards entrepreneurs and entrepreneurial activity, Poles are far more similar to Americans than to Ukrainians or Russians. (See Jackson and Marcinkowski, 1996.) Though not a staple of economic growth models, we believe that the underlying culture and norms are a significant part of any country's economic institutions and will help account for the performance of these institutions.

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Table 1: Comparative Economic Structures, US, Michigan, and Poland.

Variable	United States 1978	United States 1988	Michigan 1978	Michigan 1988	Poland 1975	Poland 1993
Industrial Structure						
% in Manufacturing (non-agriculture)	29	22	40	30	43	33
% Employ. in Establishments > 1000	14	13	24	17	NA	NA
% Mfg Emp. in Establishments > 1K	27	24	49	38	NA	NA
% Mfg Employ. in Firms > 1000	NA	NA	60	46	59	61
Max Unemployment in Period	8%		17%		16%	
Financial Institutions (per Million Population)						
Commercial Bank Headquarters	67.2		38.1			2.4
Commercial Bank Offices	185.0		189.1			88.3
Venture Captl & Sml Bus Inv Corps	1.6		.7			.3

Table 2: Employment Change in Existing and New Enterprises

Ownership	Type	Firms	Employment(in thous.)		Growing 1990-95[a]		% Loss
		1990	1990	1995	Firms	Jobs	Jobs
Public Sector							
SOE	Unchanged	4024	3839.9	2031.1	241	27.5	47.1
	Restructured	4709	1217.2	739.8			39.2
Collective	Unchanged	8175	1386.8	514.0	535	12.8	62.9
	Restructured	2115	73.9	43.2			41.5
Privatized		856	486.0	312.7	102	10.3	35.7
Private Sector							
Domestic	Small (<101)	13587	232.0	130.0	2357	68.1	44.0
	Large (>100)	461	118.1	42.0	43	1.6	64.4
Foreign	Small (<101)	778	27.2	15.9	157	8.4	41.5
	Large (>100)	342	94.1	23.0	30	2.4	75.6
New Firms	Domestic				39504	1118.2	
	Foreign				3328	144.9	

a. Defined as firms whose employment in 1995 exceeded their employment in 1990.

Table 3: Births and Size of Cohorts

Birth Year	Domestic Firms	Domestic Size	Domestic Tot Jobs (in thous.)	Foreign Firms	Foreign Size	Foreign Tot Jobs (in thous.)
1990	13587	17.1	232.0	778	34.9	27.2
1991	11820	26.8	316.5	183	40.2	7.4
1992	11284	22.5	254.3	774	32.9	25.5
1993	9748	22.5	218.9	504	33.1	16.7
1994	7728	23.0	178.1	534	32.3	17.3
1995	17291	16.8	290.8	1858	22.7	42.3

Table 4: Survival Rates Among Yearly Cohorts

Birth Year	Year 1	Year 2	Year 3	Year 4	Year 5
			Domestic		
1990	0.465	0.830	0.835	0.908	1.000
1991	0.552	0.850	0.902	0.976	
1992	0.656	0.842	0.975		
1993	0.634	0.937			
1994	0.707				
			Foreign		
1990	0.581	0.878	0.826	0.893	0.939
1991	0.732	0.896	0.867	1.000	
1992	0.765	0.916	1.000		
1993	0.760	0.979			
1994	0.841				

Table 5: Annual Employment Growth Rates for Firms, by Cohort

Birth Year	Year 1	Year 2	Year 3	Year 4	Year 5
			Domestic		
1990	1.435	1.131	1.085	1.030	1.056
1991	1.418	1.087	1.040	1.017	
1992	1.463	1.091	1.025		
1993	1.474	1.075			
1994	1.463				
			Foreign		
1990	1.279	1.100	1.059	1.068	1.036
1991	1.812	1.126	1.220	1.096	
1992	1.423	1.179	1.237		
1993	1.954	1.144			
1994	1.825				

Table 6: Annual Growth in Total Employment in Cohorts

Birth Year	Year 1	Year 2	Year 3	Year 4	Year 5
		Domestic			
1990	0.668	0.938	0.906	0.935	1.056
1991	0.783	0.925	0.938	0.993	
1992	0.959	0.918	1.000		
1993	0.935	1.007			
1994	1.034				
		Foreign			
1990	0.743	0.966	0.875	0.954	0.973
1991	1.326	1.008	1.057	1.096	
1992	1.089	1.079	1.237		
1993	1.485	1.120			
1994	1.535				

Table 7: Annual Total Real Sales Growth

Birth Year	Year 1	Year 2	Year 3	Year 4	Year 5
			Domestic		
1990	1.126	0.893	0.767	0.957	1.084
1991	0.899	0.819	0.978	0.988	
1992	0.853	0.901	1.010		
1993	0.901	0.979			
1994	1.022				
			Foreign		
1990	0.727	1.190	0.907	0.924	1.047
1991	1.789	0.862	1.192	1.038	
1992	1.207	1.005	1.219		
1993	1.452	1.160			
1994	1.535				
			Restructured		
1991	1.158	0.825	0.882	0.889	
1992	0.748	0.838	0.915		
1993	1.274	0.990			
1994	1.092				

Table 8: Equations for Births and Initial Size

	Births[a]		Initial Size			
	Domestic	Foreign	Domestic	Foreign	Minimum	Maximum
Farm	-1.501	-4.067	-17.089	44.709	0.042	0.621
	(.17)	(.38)	(5.89)	(21.09)		
log(Density)	1.072	1.558	4.882	-50.796	1.526	4.303
	(.17)	(.37)	(5.84)	(20.81)		
$[\log(\text{Density})]^2$	-0.171	-0.247	-0.710	7.907	2.329	18.513
	(.03)	(.05)	(0.90)	(3.17)		
% Lrg State-Own	-1.270	-2.563	-2.576	-4.652	0.366	0.857
	(.28)	(.60)	(8.86)	(33.34)		
German Border	0.141	0.515	-1.490	1.939	0	1
	(.05)	(.09)	(1.71)	(6.12)		
Bank HQ/capita	0.032	0.129	0.340	0.097	0.000	16.591
	(.004)	(.007)	(0.16)	(0.70)		
Bank Off/capita	-0.001	0.003	0.039	-0.206	42.225	171.521
	(.001)	(.003)	(0.03)	(0.13)		
log(Population)	0.971	0.888	0.285	1.050	0.912	3.678
	(.05)	(.09)	(1.55)	(5.67)		
Births/Pop			-0.015	-0.013	63.73	775.82
Dom/For			(.006)	(.09)	0.98	231.44
Year Dummies						
1991	-0.111	-1.500	8.965	2.176		
	(.05)	(.10)	(1.58)	(6.18)		
1992	-0.183	-0.102	4.440	-3.524		
	(.05)	(.09)	(1.59)	(5.59)		
1993	-0.315	-0.494	3.754	-3.030		
	(.05)	(.09)	(1.66)	(5.65)		
1994	-0.570	-0.410	4.031	3.134		
	(.05)	(.09)	(1.80)	(5.61)		
1995	0.251	0.830	1.445	-12.543		
	(.05)	(.08)	(1.66)	(6.10)		
Constant	5.534	2.585	16.304	122.600		
α	0.050	0.088				
	(.005)	(.017)				
R^2 (For births/capita)	0.72	0.92	0.24	0.08		
Mean Births/Size	243	18	20.62	35.75		
Min. Births/Size	32	0	10.55	5.00		
Max. Births/Size	1763	558	112.68	324.00		

a. Estimated equation for births is negative binomial event count model.

Table 9: Equations for Survival and Growth

	Survival		Growth	
	Domestic	Foreign	Domestic	Foreign
Farm	0.024	-0.080	0.131	0.003
	(.04)	(.11)	(.10)	(.52)
log(Density)	-0.036	-0.357	-0.193	-0.626
	(.04)	(.09)	(.09)	(.59)
$[\log(\text{Density})]^2$	0.005	0.043	0.034	0.075
	(.005)	(.01)	(.01)	(.08)
% Lrg State-Own	0.016	0.020	0.156	0.617
	(.06)	(.13)	(.14)	(.88)
German Border	0.000	-0.025	-0.002	-0.146
	(.01)	(.02)	(.02)	(.13)
Bank HQ/capita	-0.008	-0.011	0.026	0.115
	(.01)	(.02)	(0.02)	(0.10)
Bank Off/capita	-0.003	-0.027	0.005	0.019
	(.002)	(.007)	(0.006)	(0.04)
Year Dummies				
1992	0.112	0.165	0.126	0.823
	(.01)	(.03)	(.04)	(.19)
1993	0.158	0.146	0.088	0.495
	(.01)	(.02)	(.03)	(.15)
1994	0.169	0.168	0.085	0.907
	(.01)	(.02)	(.03)	(.18)
1995	0.252	0.247	0.076	1.029
	(.02)	(.03)	(.03)	(.19)
Constant	0.788	1.518	1.469	1.633
A_1	-0.251	-0.096	0.503	1.218
	(0.01)	(.01)	(.03)	(.123)
A_2	-3.309	-50.00	-3.421	-1.648
	(.56)	(a)	(.76)	(.70)
α	-0.001	0.026	-0.098	-0.169
	(.01)	(.01)	(.02)	(.04)
R^2	0.82	0.35	0.64	0.28

a. Asymptotic standard error not estimated. See text.

Table 10: Changes in the Michigan Economy, 1978-1988; by Size

	Firm Size in 1978					
	1 - 20	21 - 100	101 - 500	> 500, ex. auto	> 500 w/auto	Births
			All Sectors[a]			
bs Gained	139.0	132.7	110.7	92.2	92.2	480.5
bs Lost	-235.2	-209.6	-160.5	-247.8	-449.3	
et	-96.2	-76.9	-49.8	-155.5	-357.1	
			Manufacturing			
bs Gained	31.6	44.5	29.7	21.3	21.3	92.5
bs Lost	-28.0	-56.8	-68.4	-161.4	-362.9	
et	+3.6	-12.3	-38.7	-140.1	-341.6	

Includes manufacturing, wholesale, retail, and services, (SICs 2 - 7).

Table 11: Michigan Birth Cohorts

Birth Year	$Size_0 \leq 5$ Firms	$Size_0 \leq 5$ Size	$Size_0 \leq 5$ Tot Emp	$Size_0 > 5$ Firms	$Size_0 > 5$ Size	$Size_0 > 5$ Tot Emp
1979	6373	2.00	12719	1352	17.78	24035
1980	5405	2.01	10849	1159	18.16	21051
1981	5860	2.08	12184	1204	20.19	24305
1982	5947	2.05	12178	1236	19.94	24641
1983	6284	2.10	13176	1543	19.19	29611
1984	5908	2.25	13282	2020	23.46	47393
1985	7413	2.22	16462	2431	20.71	50337
1986	7919	2.16	17101	2217	18.37	40719
1987	7960	2.13	16923	2338	22.28	52095
1988	6399	2.13	13619	2036	20.92	42589

Table 12: Average Annual Survival And Growth Rates for Michigan Firms[a]

	Year							
	1	2	3	4	5	6	7	Year 7/Year 1
Annual Survival Rates								
$Size_0 \leq 5$	.830	.802	.854	.875	.887	.898	.911	0.361
$Size_0 > 5$	.888	.855	.885	.894	.894	.901	.904	0.438
Annual Growth Rates in Employment per Firm								
$Size_0 \leq 5$	1.316	1.251	1.192	1.145	1.142	1.119	1.122	3.222
$Size_0 > 5$	1.094	1.149	1.087	1.104	1.102	1.114	1.040	1.925
Annual Growth Rates in Total Employment								
$Size_0 \leq 5$	1.091	1.003	1.018	1.003	1.013	1.001	1.022	1.162
$Size_0 > 5$	0.972	0.980	0.962	0.986	0.985	1.004	0.941	0.841

a. All sectors