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REGIONAL VARIATION IN NEW FIRM FORMATION IN TURKEY: CROSS-SECTION AND PANEL DATA EVIDENCE

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Since the 1980s the promotion of the formation of new firms has been considered as the main policy in dealing with the problem of uneven regional economic development in many countries. The determination of regional characteristics that are influential on new firm formation is quite a bit essential to develop realistic and efficient policies to solve this problem. Turkey is one of the countries with a substantial variation in new firm formation across her regions which are also significantly diversified in terms of social and economic structures. In this context, the present study explores the variation in new firm formation in manufacturing sector across regions of Turkey and investigates the effects of regional characteristics on new firm formation. Furthermore, the study provides a comparison of the differences in regional variation in underlying firm birth processes between developed countries and Turkey as a representative of a developing country.

The results of the cross-section and panel data analyses show that population density is the most significant variable in explaining regional variation in new firm formation in manufacturing sector in Turkey. Such an outcome supports the urban incubator theory implying that urban context contributes to new firm formation in manufacturing in Turkey.

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1. Introduction

The role of small and new firms in the process of economic development both at local and national levels has long been discussed in the literature. The results of empirical studies show that the "new firm phenomenon" in most cases implies a "small firm phenomenon", since most of the new firms start small and more crucial than this most of the newly created jobs are generated by new firms that start small. Many researchers (Invernizzi and Revelli, 1993; Gallagher and Robson, 1994; Reynolds, Storey and Westhead, 1994; Ashcroft and Love, 1996; Thurik and Wennekers, 1999) using data for different countries give evidence of small and new firms' contribution to economic growth as measured by net new job generation. Moreover, small firms directly and indirectly stimulate technological progress and contribute to economic development. On the one hand, small firms with their organizational structure conducive to flexible technology innovate more and as "agents of change" (Acs and Audretsch, 1993; 2001) directly contribute to economic development. On the other hand, small firms providing a role model promote entrepreneurship in the society and as a "seedbed for entrepreneurship" (Fritsch, 1992) indirectly contribute to economic development. With a Schumpeterian view, innovativeness in regional and national levels keeps an ever-dynamic body in terms of technological progress and provides competitive advantage which in turn leads to economic development. Furthermore, each new firm or new market entry represents a challenge to the incumbents and, in doing so, may generate significant incentives for improvements (Fritsch and Falck, 2003).

Based upon the theoretical and empirical evidence of small and new firms' significant role in economic development, many politicians and economists have the intuition that new possibilities for growth, innovation and creating jobs will come from small and new firms (Thurik and Wennekers 1999). And since the 1980s the promotion of the formation of small firms has been considered as the main policy in dealing with the problem of uneven regional economic development in many countries. Turkey is a country which has an economy characterized by substantial regional disparities. The concentration of economic activities in highly populated urban areas in certain regions leads to migration from rural, particularly agricultural areas, to urban areas, which further increases regional

disparity. Hence, in the last decades a great deal of government policy concentrates on regional development. In particular, the Seventh and the Eight Five Year Development Plans propose support for the Small and Medium Sized Establishments (SMEs) to reduce existing regional disparities by stimulating local development. However, these plans do not provide a comprehensive framework. In this regard, the examination of regional characteristics that are influential on the formation of SMEs certainly yields a better insight to design effective policies aiming at regional economic development.

The main argument behind this study is that regional characteristics have a substantial impact on new firm formation. Based on the evidence of regional variation in firm birth rates in Turkey, this study is an attempt to analyze the determinants of variation in small and new firm formation across the regions of Turkey using a multivariate linear regression model. The aim of this study is twofold. First, the variation in small and new firm formation across the regions of Turkey is explored and the effects of regional characteristics on new firm formation are determined. Second, the differences in regional variation in underlying firm birth processes between developed countries and Turkey as a representative of a developing country are investigated.

The study is organized as eight main sections. An overview of the study is provided in the first section. The second section reviews briefly the hypotheses and evidence in the literature of direct relevance and presents the objectives of this study. The third section examines regional disparities in Turkey and puts forward the motivation for this study. The next section explains the measurement and spatial pattern of small and new firm formation in Turkey. The fifth section introduces the potential explanatory variables of the econometric model and the methods of analysis used in this study. The sixth and the seventh sections report the results of cross-section and panel data analyses respectively. Finally, the last section concludes presenting policy implications.

2. Literature Review and Objectives of the Study

In many countries, including the advanced ones, it has been observed that there are regional disparities in economic growth as measured by new firm formation rates and job generation. Some of the regions, especially the highly populated urban areas are more

prosperous and have higher birth rates relative to the rural areas. As an evidence, in Sweden, regions with the largest population, Stockholm, Gothenburg and Malmö, are among those with the highest rate of new firm formation (Davidsson, Lindmark and Olofsson, 1994) and in West Germany 58.1 % of the new firm births take place in agglomerations, 26.3 % in moderately congested areas and only 13.8 % in rural areas (Fritsch, 1992). As new firm births, especially the formation of small and medium sized firms (SMEs) have been considered as an underlying determinant of economic growth in developed countries since the 1980s, government policies focus on promoting start-ups to alleviate the regional disparities. In dealing with the differential regional economic growth, for realistic policy implications the regional characteristics that are influential in new and small firm formation have to be determined. In most of the studies, the impacts of regional characteristics on new firm formation are examined in this regard (see Guesnier, 1994; Reynolds, 1994; Davidsson, Lindmark and Olofsson 1994; Garofoli, 1994).

The determinants of regional variation in new firm formation are analyzed for many countries, majority of which is economically advanced; for West Germany by Fritsch (1992) and Audretsch and Fritsch (1994), for Republic of Ireland by Hart and Gudgin (1994), for Italy by Garofoli (1994), for United States by Reynolds (1994) and by Acs and Armington (2002), for Sweden by Davidson, Lindmark and Olofsson (1994), for France by Guesnier (1994), for United Kingdom by Keeble and Walker (1994) and by Johnson and Parker (1996), for Greece by Fotopoulos and Spence (1999), for Finland by Kangasharju (2000) and for Spain by Callejon and Segarra (2001). Each analyzes the aggregate economy or different sectors in different periods using different units of analysis and varying indicators. In these studies a set of regional characteristics concerning social, political, environmental and economic structure of a region are examined to explain the variation. The explanatory variables that are generally found to be the most significant are various measures of demand, urbanization and agglomeration, unemployment and firm size structure.

Since most of the studies in the literature are related to developed countries, it is interesting to conduct such an analysis for a developing country, Turkey. Such an approach enables comparison between the results of this study and those of others which in turn reveals the differences in regional variation in underlying firm birth processes between

developed and developing countries. For a reliable comparison the time span of this study, the method of analysis and the set of possible determinants of regional variation in firm formation are all chosen in line with the studies on advanced countries. In this regard, the effects of regional characteristics on new firm formation are investigated using a cross-section data analysis together with a panel data analysis, since in the most of the studies - except the ones by Kangasharju (2000), Callejon and Segarra (2001) and Johnson and Parker (1996)- determinants of regional variation are analyzed using a cross-section data analysis.

Taymaz (1997) analyses the dynamics of new firms in manufacturing in Turkey to shed light on SME birth and deaths, failures and successes. This study examines the determinants of entry at the industry level, but ignores the spatial dimension. Yunusoğlu (1995) is another study, which accounts for variation in new firm formation across sectors and regions for different periods, however the analysis is limited to three provinces namely Ankara, İzmir and İstanbul. The present research examines the variation in new firm formation across the provinces in seven geographical regions of Turkey and investigates the impact of regional characteristics on new firm formation.

3. Regional Disparities in Turkey

One of the main problems of Turkey is the uneven regional economic development and the continuously increasing gap between the most and the least developed regions. If the contribution of regions to GDP in 1983 and in 1997 (Table A.1) is compared, it is obvious that there is a substantial difference between the region with the highest share and the one with the lowest share. Furthermore, the gap between the regions has increased over time. A further point to note is that the contribution of Marmara region to GDP is about 37 % in 1983 and 38 % in 1997, which correspond to 1/3 of the total GDP in each year. The examination of the average annual GDP per capita across regions (Table A.2) also reveals the uneven regional economic development in Turkey. In both years, GDP per capita in Marmara Region is about 4 times larger than that in Eastern Anatolian Region.

Another indicator of the uneven regional economic development in Turkey is the substantial differentiation in terms of distribution of industrial activities among the regions

of Turkey. In 1998 (Table A.3), half of the all manufacturing establishments and more than half of the total employment in manufacturing concentrate in Marmara Region with a 56% share in total value added in manufacturing. However, the shares of Eastern Anatolian Region in total stock of establishments, in employment and in value added in manufacturing in 1998 are 1%, 2% and 1% respectively. These figures imply that production and employment tend to concentrate in a certain region in Turkey. Such a pattern can be interpreted as an indicator of a centripetal development in Turkey. This centripetal development has been responsible for the long-term migration out of peripheral, rural and mostly agricultural areas to urban areas, mainly to the regions in the west and north-west of Turkey namely Marmara Region and Agean Region (see Table A.4)

It has been observed that there is a substantial regional variation in new firm formation in Turkey. When we examine the annual regional firm birth rates (Table A.5), described as the number of new SMEs in a region per 100 000 individuals in labor force in that region, in 1985 Marmara Region with the highest population and density has a birth rate that is 17 times larger than that of the Eastern Anatolian Region with the lowest population and density. In the meantime, the gap in terms of firm birth rates between the regions with the highest and the lowest firm birth rates has increased. In 1990, Marmara Region has a birth rate of 5.3, the highest firm birth rate and it is 53 times larger than that of South Eastern Anatolian Region, the region with the lowest firm birth rate. As it is indicated, there is a substantial regional variation in new firm formation in Turkey and this variation forms the basis of this study.

4. Measurement and Spatial Pattern of Small and New Firm Formation

This study uses a dataset constructed by the State Institute of Statistics (SIS) of Turkey. The basic unit of this longitudinal data set is a business establishment and it covers all private and public establishments in manufacturing. But, the analysis is restricted to small and medium sized establishments in manufacturing, the establishments with employees more than 9 and less than 200, since nearly all of the new firms in Turkey start small. As evidence, 96% in 1985 and 94% in 1990 of all new firms in manufacturing are in small and medium size.

The analysis is carried out at a provincial level and it covers 58 provinces in seven geographical regions (Figure B.1), namely Mediterranean, Eastern Anatolian, South Eastern Anatolian, Central Anatolia, Black Sea, Aegean and Marmara regions, of Turkey. Until 1989 there were only 67 provinces in Turkey, however beginning from 1989 till the end of 1999 for certain reasons new provinces were added through separations from the existing ones and over this period the number of provinces increased to 81. For simplification, the values related to provinces that were founded after 1988 are added to the provinces from which they were separated. Among the 67 provinces, 9 provinces namely Adıyaman, Artvin, Bingöl, Bitlis, Gümüşhane, Hakkari, Mardin, Siirt and Tunceli are left outside the empirical analysis due to lack of reliable data.

For a proper comparison across regions the numbers of new firms are standardized and annual firm birth rates are calculated for each of the 58 provinces. The need for standardization is emphasized by many scholars in the literature. Audretsch and Fritsch (1994), Fritsch (1992) and Kangasharju (2000) point out that comparing the absolute numbers of firm births across regions is misleading, since regions are not homogenous in terms of size. Labor Market Approach and Ecological Approach are the two methods that are generally used to standardize number of new firms. The first method based on the theory of entrepreneurial choice standardizes the number of new firms relative to the number of workers or the active population or labor force. The latter method standardizes the number of new firms with respect to the population of existing firms. The use of ecological approach, relating firm births to existing firm population, as a measure of normalization, is criticized on both theoretical and empirical grounds by many researchers. The criticisms directed to the use of the ecological approach are manifold. Among those Audretsch and Fritsch (1994) and Garofoli (1994) point out that ecological approach leads to measurement biases by overstating birth rates in regions where the small firms are more in number and by understating the birth rates in regions where large firms are dominant.

Although, in this study the use of labor market approach is preferred as a measure of standardization, absolute number of new firms is also standardized using ecological approach. The reason for the use of both measures is to facilitate comparison between the results of the analyses based on different measures. In the literature, there is evidence that

the spatial patterns differ when the birth rates are calculated through application of different methods (see Keeble and Walker, 1994; Garofoli, 1994).

In the context of labor market approach, the use of labor force as a measure of standardization seems more appropriate than the use of active population since it is more consistent with the theory of entrepreneurial choice proposed by Evans and Jovanovic (1989). In this regard, the use of active population tends to underestimate the size of potential entrepreneurs neglecting the size of unemployed and the use of total population tends to overestimate the size of potential entrepreneurs. The bias towards underestimation is to be higher when the birth rates in each sector are standardized as the proportion of number of new firms in a given sector to the number of employees-active population- in that sector. Founders might have worked in a different sector before they start their own businesses (Fritsch, 1992). In this study it is preferred to approximate the potential entrepreneurs with the total labor force defined as the employees in all sectors plus the unemployed. The use of labor force as a measure of standardization runs the risk of undervaluation. In Turkey, the data pertaining to employment and unemployment is biased towards undervaluation since employees, who are informally employed, without any legal insurance, cannot be recorded and individuals who work in the informal sector reveal their employment status as being unemployed in the surveys. However, among the other alternatives labor force seems to be the best one to approximate the potential entrepreneurs.

The annual firm birth rates are calculated for 58 provinces of Turkey for the years between 1985 and 1990, using both the labor market approach and the ecological approach. Using these birth rates the variety and complexity of spatial patterns of new firm formation are illustrated in Figures B.2 – B.5. They reveal how different patterns are obtained when the alternative labor market approach and ecological approach are used for calculating firm birth rates. It is remarkable that the spatial patterns, the extent of variation and the ranking of the values differ when the firm birth rates are calculated using different methods. Figures B.3 and B.5 illustrating number of new SMEs per 100 000 individuals in the labor force across provinces for the years 1985 and 1990 respectively yield a strict west-east divide characterized by low firm birth rates in eastern and high firm birth rates in western Turkey. However, the firm birth rates calculated using ecological approach yield a relatively dispersed pattern (Figure B.2 and Figure B.4). On a closer examination, it is

found out that a highly concentrated Istanbul focused pattern is obtained when the firm birth rates are calculated as the ratio of number of new SMEs to labor force.

The firm birth rates calculated using labor market approach across provinces for the years 1985 and 1990 indicate that most of the provinces with the highest firm birth rates are located in Marmara Region. In particular, the provinces namely Istanbul, Bursa, Tekirdağ and Kocaeli located in Marmara Region are among those with the highest firm birth rates. Therefore, small and new firm formation tends to concentrate in Marmara Region, which has the most densely populated provinces. A closer examination reveals a highly concentrated Istanbul focused pattern characterized by Istanbul as its center with the highest firm birth rate and by the provinces, Bursa, Tekirdağ and Kocaeli surrounding Istanbul.

5. Regional Determinants of Small and New Firm Formation

In the present study the determinants of regional variation in small and new firm formation across the regions of Turkey are analyzed using a multivariate linear regression model. The analysis uses two different firm birth rates: one is identified according to labor market approach and the other is according to ecological approach. GROSSLAB, the firm birth rate calculated in accordance with labor market approach, represents the number of new firms in manufacturing per 100 000 individuals in the labor force. GROSSEST, the firm birth rate calculated in accordance with ecological approach, stands for the number of new firms in manufacturing per 100 establishments. These birth rates are identified for each province as follows;

GROSSLAB = (Total number of new SMEs in manufacturing in a province in a certain year / total labor force in that province in that year) * 100 000

GROSSEST = (Total number of new SMEs in manufacturing in a province in a certain year / total number of establishments in manufacturing in that province in that year) * 100

The variables used in this study in explaining regional variation in new firm formation in Turkey are determined in a manner which facilitates comparability with other studies in a developed-country versus developing-country perspective. In this regard, the possible determinants of regional variation in new firm formation in Turkey are taken to be the ones used in the cross-national study by Reynolds, Storey and Westhead (1994), but the indicators differ. It is considered that the variables have impact on new firm formation with a lag. For this reason, the model is formulated such that the firm birth rate in a certain year (t) is regressed on the figures pertaining to the preceding year (t-1).

The regional characteristics that are thought to be the possible determinants of new firm formation in Turkey are gathered into three main groups: demand-side variables, supply-side variables and policy variables.

Demand-side variables:

It is hypothesized that increasing demand for goods and services is associated with higher firm births. Since growth in population and rise in per capita income lead to increases in demand, annual growth rate of real GDP per capita (GRGDP) and annual growth rate of population (GRPOP) are used as the indicators of change in demand.

Supply-side variables:

Supply side variables include the variables that reflect supply of founders and resources required to get a business started.

(i) Human Capital (Availability of motivated and capable individuals)

- **Urbanization / Agglomeration**

In an urban context, concentration of people and firms in a certain area decreases both the cost of access to customers and cost of access to suppliers (Reynolds, 1994). Also it becomes easy for both the consumers and producers to benefit from certain services that is available in urban areas. Therefore, due to these pecularities urban areas are attractive places for the younger and better educated adults who are the potential entrepreneurs. Krugman (1991) identifies three reasons for the localization of industrial activities; existence of pooled market for workers with industry-specific skills, production of non-tradable specialized inputs and knowledge spillovers. In the light of these claims, it is

hypothesized that urban areas with higher population densities are associated with higher birth rates in Turkey, since the provinces with the highest firm birth rates are the ones with highest population density and immigration rates. Figures F.1–F.4 reveal that the highest firm birth rates are observed in provinces which are densely populated. The indicators used to measure the effect of agglomeration economies on new firm formation in Turkey are population density (POPDEN) and share of immigrants in the population (IMMIG).

- **Educational Qualifications**

It is hypothesized that presence of individuals with higher education would contribute to new firm formation. Since in this study labor force is used to proximate the potential entrepreneurs, it is more appropriate to analyze the educational qualifications of the labor force rather than the total population. In this regard, share of the university graduates in the labor force (POPEDU) is used to assess the impact of the educational qualification of potential entrepreneurs on new firm formation in this analysis.

- **Occupational Qualifications**

It is hypothesized that presence of individuals in technical and managerial occupations would contribute positively to new firm formation. The indicator to be used to measure the effect of occupational qualification of potential entrepreneurs on new firm formation in this analysis is the share of the labor force in technical professions (POPTECH).

- **Unemployment**

Based on the empirical results provided by the studies in the literature and on the theoretical arguments supported in the literature it can be concluded that the effect of unemployment on new firm formation is ambigous. When individuals lose their job in one firm, they can either start to work as an employee in another firm or start their own businesses. Then, unemployment might be positively correlated with firm births. On the other hand, since high level of unemployment is associated with low level of demand for goods and services one can expect a negative impact on new firm formation. The indicators used to determine the role of unemployment in new firm formation are unemployment rate (UNEMP) and change in unemployment (GRUNEMP).

- **Role models and Relevant Experience**

The empirical findings in the literature indicate that the share of small manufacturing firms, acting as an incubator for entrepreneurship, and the share of autonomous workers have a

positive impact on new manufacturing firm formation. Average firm size (ESTSIZE) and share of entrepreneurs in the labor force (POPENT) are the two indicators that are used to measure the effect of presence of small firms and autonomous workers on new firm formation.

(ii) Financial Capital (Availability of Financial Resources)

Another variable, which appears as a positive stimulus to new firm formation, is availability of capital. It has an important role in getting a business started. In this study, the local availability of financial resources is embodied in annual growth rate of bank deposits (GRDEP).

Policy Variables:

It is hypothesized that government expenditures have a positive impact on new firm formation since government investments as new establishments and government infrastructure expenditures both stimulate new firm formation. The share of each province in government investment expenditure (GOVIN) is used to measure the effect of government expenditure on new firm formation.

The time span this study covers, the method of analysis and the set of possible determinants of regional variation in new firm formation are all chosen in line with the previous studies to be able to provide comparability with the other studies. In order to simplify comparison, it is preferred to use the cross-section data analysis which is commonly used in most of the studies in the literature. Due to the shortcomings of the cross-section data analysis, the models in this study are estimated using panel data analysis together with cross-section data analysis. Both analyses are carried out using the package program Stata 6.0 for statistics/data analysis.

6. Results of Cross-section Data Analysis

In the cross-section data analysis, the multivariate linear models are estimated for each six years separately using the ordinary least squares (OLS) regression analysis. Before the regression analysis is carried out, focusing on the matrices of correlation coefficients it is examined whether the data supports the hypothesized relations between the variables and

new firm formation. A careful examination of the correlation coefficients provides evidence to what extent the hypothesized relations hold. In this regard, Tables C.1-C.6 presenting correlation coefficients between the firm birth rates and the explanatory variables for years 1985, 1986, 1987 1988, 1989 and 1990 respectively indicate that the relations between the GROSSLAB and the explanatory variables are as they are hypothesized. A positive relationship seems to exist between new SMEs formation rate and annual growth rate of real GDP per capita (GRGDP), annual growth rate of population (GRPOP), population density (POPDEN), share of immigrants in the population (IMMIG), share of university graduates in the labor force (POPEDU), share of the labor force in technical professions (POPTECH), unemployment rate (UNEMP), share of entrepreneurs in the labor force (POPENT), annual growth rate of bank deposits (GRDEP) and government investment expenditures (GOVIN). A negative relationship emerges for the change in unemployment (GRUNEMP) and average firm size (ESTSIZE).

When the regression results are examined, it is found out that for the years 1986, 1987 and 1989 two partial slope coefficients are statistically significant and support the hypothesized relations. The coefficients of POPDEN and POPTECH in 1986 and in 1987, the coefficients of POPDEN and GRUNEMP in 1989, even for the year 1990 only one partial slope coefficient, that of POPDEN, is statistically significant at 0.10 level (Table D.1.1). POPEDU is also found to be statistically significant in the analyses for the years 1986 and 1987, but it has a negative coefficient. Such an outcome contradicts with the expectation. R^2 values for the years 1986, 1987, 1989 and 1990 are found to be 0.64, 0.76, 0.50 and 0.48 respectively (see Appendix D, Table D.1.1). These high R^2 values together with few significant t ratios and the high correlation coefficients between the regressors POPEDU, POPTECH and POPENT (see Appendix C, Tables C.1-C.6) are symptoms of multicollinearity between the explanatory variables. The existence of multicollinearity is investigated using Variance Inflation Factor (VIF) analysis. As a rule of thumb a VIF in excess of 10 is worth further investigation. The VIF values for the explanatory variables POPEDU, POPTECH and POPENT for all six years are all in excess of 10 (see Appendix E, Tables E.1-E.6) indicating the existence of linear relationship between these variables. This can be attributed to the fact that entrepreneurs in Turkey are highly educated, some of which may be technicians again with qualified level of education. Examining the VIF

values (see Appendix E, Tables E.1.1-E.1.6) for all years it is observed that POPEDU has the highest VIF value, so it is decided to omit it from the equation.

However the problem of multicollinearity continues to exist (see Appendix D, Table D.1.2 and Appendix E, Tables E.2.1-E.2.6). The VIF values for the variable POPENT is higher than 10 and hence it is omitted from the regression equation. It is noticed that the VIF values and the t values for the significant variables are improved compared to the previous regression analyses. (see Appendix D, Table D.1.3 and Appendix E, Tables E.3.1-E.3.6).

After the analysis of multicollinearity, the model is tested for the presence of heteroscedasticity. The results of the Cook-Weisberg test for heteroscedasticity (see Appendix D, Table D.1.3) indicates the existence of heteroscedasticity for the years 1986, 1987, 1988 and 1989. In order to deal with this problem the econometric equation is estimated adopting the *robust regression analysis*.

The estimated model using robust regression analysis for 6 years explains 64%, in average, of the variation in new firm formation at provincial level. The model itself is also statistically significant. The results show that among the 10 regressors for all six years, population density tends to be the most significant regressor, whereas variables proxing demand growth have positive but surprisingly insignificant coefficients (see Appendix D, Table D.1.4). Such an outcome indicates that urban context contributes to new firm formation in manufacturing in Turkey. It is clear from the Figures F.1-F.2 and F.3-F.4 of Appendix F illustrating population density and firm birth rates by provinces for the years 1985 and 1990 respectively that the densely populated provinces account for the highest firm birth rates. Apart from these, the results of the regression analysis for the years 1985 and 1986 indicate that the share of technicians in the labor force has a positive statistically significant effect on new firm formation in Turkey. Since qualified individuals concentrate in urban areas, this finding also support the view that urban areas are conducive to formation of new firms in manufacturing in Turkey. Only in the analysis for the year 1986 rate of unemployment yields a negative statistically significant effect indicating that higher levels of unemployment correspond to lower firm formation rates. What is interesting is that only the results of the regression analysis for the year 1985 provide evidence for the statistically significant effect of government investment expenditure. However its

coefficient has a negative sign. In this regard, it supports the view that government expenditure can be reflected as higher local taxes and so depresses new firm formation. A further point to note is that, only in the regression analysis for the year 1989, annual growth rate of real GDP per capita proxing demand growth is found to be statistically significant with a negative sign. This outcome contradicts with the findings of other studies in the literature.

Based on these results it can be concluded that underlying determinants of firm formation differ between developed and developing countries. Since, the results of the cross-section data analysis indicate that among the 10 regressors for all six years, population density tends to be the most significant regressor; whereas variables proxing demand growth (GRGDP and GRPOP) are surprisingly not significant. However in most of the studies for advanced countries (e.g. cross-national analysis including Germany, France, United Kingdom, Sweden and USA) demand growth is found to be the most significant process explaining the regional variation in new firm formation. In contrast with the results of Garafoli (1994), Hurt and Gudgin (1994), Davidsson, Lindmark and Olofsson (1994) and Kangasharju (2000), the results of this analysis show that urban context significantly contributes to new firm formation in manufacturing in Turkey.

A further point to note is that the results of the cross-section data analysis of the model with GROSSEST as dependent variable is not satisfactory, since the estimated model accounts for only 27%, in average, of the variation and the model itself is significant only for four cases out of six (see Appendix D, Table D.2.2). This evidence of the inadequacy of the model with GROSSEST in explaining variation in new firm formation supports the use of labor market approach as a method of standardization.

7. Results of Panel Data Analysis

For the panel data analysis, the six cross-sections are pooled and a data set of 348 observations which is 58 provinces each observed for 6 different years is created. The model is estimated using feasible generalized least squares (FGLS) analysis.

Note that there exits the problem of heteroscedasticity in four cross-sectional analysis out of six. This cross-sectional evidence of heteroscedasticity implies that the

variances differ across the panels. Under the assumption that the disturbances have different variances for each panel and are constant within panel, it is better to estimate the model by feasible generalized least squares (FGLS).

The FGLS results show that (see Appendix G, Table G.2) population density is the most significant variable explaining the variation in new firm formation. In this sense, the result of panel data analysis supports that of cross-section data analysis. However, there is a substantial difference between the result of this panel data analysis and that of the study by Kangasharju (2000) for Finland. Kangasharju (2000) reports that the average size of establishments is the most significant regressor, whereas population density is not a significant regressor. Share of technicians in the labor force is another variable that is found to be statistically significant and it has a positive impact on new firm formation. These empirical findings support the urban incubator theory which implies that metropolitan areas, urban centers and core regions are nurseries of new firms. Furthermore, the results obtained indicate that population growth proxying demand growth has a positive significant effect on new firm formation, a result obtained in most of the cross-section data analyses for developed countries. The findings imply a negative significant impact of rate of unemployment on new firm formation. The results of the panel data analysis and cross-section data analyses related to the role of unemployment in new firm formation are similar and imply that higher rates of unemployment are associated with lower firm birth rates in manufacturing in Turkey.

8. Conclusion

The results of both the cross-section data analyses and the panel data analysis indicate that population density is the most significant variable explaining the variation in new firm formation across the regions of Turkey. Share of technicians in the labor force is another variable that is found to be significant and it has a positive impact on new firm formation. These empirical findings support the urban incubator theory which implies that metropolitan areas, urban centers and core regions are nurseries of new firms. In panel data analysis annual growth rate of population, one of the two variables proxing demand growth, yields a significant positive impact on new firm formation, a result obtained in most of the

cross-section data analyses for developed countries. However, in the cross-section analyses the coefficient of the variable GRGDP, annual growth rate of real GDP per capita, indicates a negative impact of demand growth on new firm formation. A further point to be mentioned is that the results of the panel data analysis and cross-section data analyses related to the role of unemployment in new firm formation are similar and imply a negative significant impact of the rate of unemployment on new firm formation. That is, higher rates of unemployment are associated with lower firm birth rates in manufacturing in Turkey.

The results of the cross-section data analyses for Turkey indicate that population density is the most significant regressor with a positive impact; whereas variables proxing demand growth (GRGDP and GRPOP) are surprisingly not significant. However in most of the studies for advanced countries (e.g. cross-national analyses including Germany, France, United Kingdom, Sweden and USA) demand growth is found to be the most significant variable explaining the regional variation in new firm formation. In contrast with the findings of Garafoli (1994), Hurt and Gudgin (1994), Davidsson, Lindmark and Olofsson (1994) and Kangasharju (2000), the results of this analysis show that urban context contributes to new firm formation in manufacturing in Turkey. A further point to note is that the model based on the dependent variable normalized according to the labor market approach explains the variation better than the one based on the dependent variable normalized according to the ecological approach.

As a regional policy implication, the above results call for government investment to improve local social and political milieu. The positive significant impacts of population density, share of technicians in the labor force and population growth all support the urban incubator theory based on the crucial role of metropolitan areas and core regions. In order to stimulate indigenous development via new and small firm formation government had better to provide the less densely populated areas with infrastructure. Expenditure on local infrastructure improves the quality of environment in a locality and makes it more attractive for the potential entrepreneurs to start a new business.

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APPENDIX A

Table A.1. Contribution of Regions to GDP at 1987 Prices

REGIONS	1983	1997
Mediterranean	11.4%	12.1%
Eastern Anatolia	4.5%	**3.3%**
Aegean	16.5%	16.8%
South Eastern Anatolia	**3.9%**	5.3%
Central Anatolian	15.4%	15.3%
Blacksea	11.2%	9.0%
Marmara	**37.1%**	**38.2%**

Source: Regional Development in the period 1983-1997, SPO, 1999

Table A.2. Average Annual GDP per Capita across Regions

REGIONS	1983*	1997*
Mediterranean	1.138	1.657
Eastern Anatolia	517	683
Aegean	1.476	2.172
South Eastern Anatolia	565	952
Central Anatolia	1.003	1.616
Blacksea	827	1.271
Marmara	2.038	2.618

Source: Regional Development in the period 1983-1997, SPO, 1999

* Thousand TL, at 1987 prices

Table A.3. Share of Regions in Total Stock of Establishments, in Employment and in Value Added in Manufacturing in 1998

REGIONS	Establishments	Employment	Value Added*
Marmara	50%	52%	56%
Aegean	18%	16%	16%
Central Anatolia	15%	13%	12%
Blacksea	7%	7%	5%
Mediterranean	6%	7%	8%
South Eastern Anatolia	3%	2%	2%
Eastern Anatolia	1%	2%	1%

* at 1987 prices

Table A.4. Net Migration and Rate of Net Migration across Regions of Turkey

REGIONS	1980-1985*	1985-1990*
Mediterranean	83937 (16)	131117 (20)
Eastern Anatolia	-220101 (-50)	-432390 (-82)
Aegean	84463 (14)	182981 (26)
South Eastern Anatolia	-80656 (-23)	-144166 (-30)
Central Anatolia	-50373 (-6)	-150106 (-16)
Blacksea	-208858 (-30)	-428088 (-53)
Marmara	391593 (39)	840652 (69)

Source: Regional Development in the period 1983-1997, SPO, 1999
Provincial and Regional Statistics, SIS, 1993
* Rate of net migration %0 in parenthesis

Table A.5. Firm Birth Rates, Standardized according to the Labor Market Approach, across the Regions of Turkey

REGIONS	1985	1986	1987	1988	1989	1990
Mediterranean	1,6	0,9	0,8	0,7	0,8	0,8
Eastern A.	**0,5**	0,2	0,4	0,2	0,3	0,2
Aegean	3,4	3,5	2,6	2,8	2,3	2,2
South Eastern A.	1,2	1,0	0,5	0,3	0,4	**0,1**
Central A.	2,6	1,6	0,8	0,9	0,9	1,2
Blacksea	1,8	1,4	0,9	0,3	1,3	0,5
Marmara	**8,4**	6,7	6,2	7,5	6,4	**5,3**

(Number of new SMEs in manufacturing per 100 000 individuals in the labor force)

APPENDIX B

Figure B.1. 67 Provinces in Seven Geographical Regions of Turkey

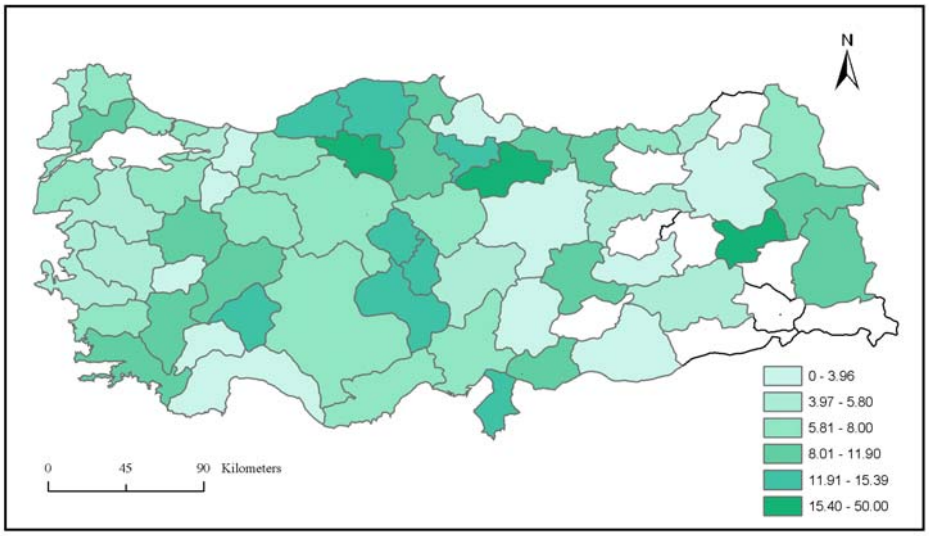

Figure B.2. Firm Birth Rates Calculated Using Ecological Approach across 58 Provinces, 1985
(Number of new SMEs in manufacturing per 100 establishments)

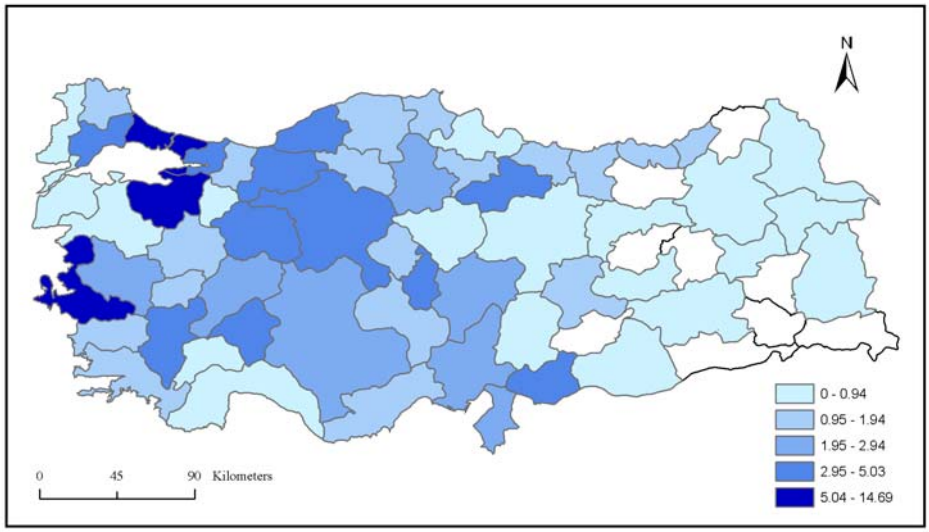

Figure B.3. Firm Birth Rates Calculated Using Labor Market Approach across 58 Provinces, 1985
(Number of new SMEs in manufacturing per 100 000 individuals in the labor force)
(provinces in white on the maps are ignored in the analyses due to lack of reliable data)

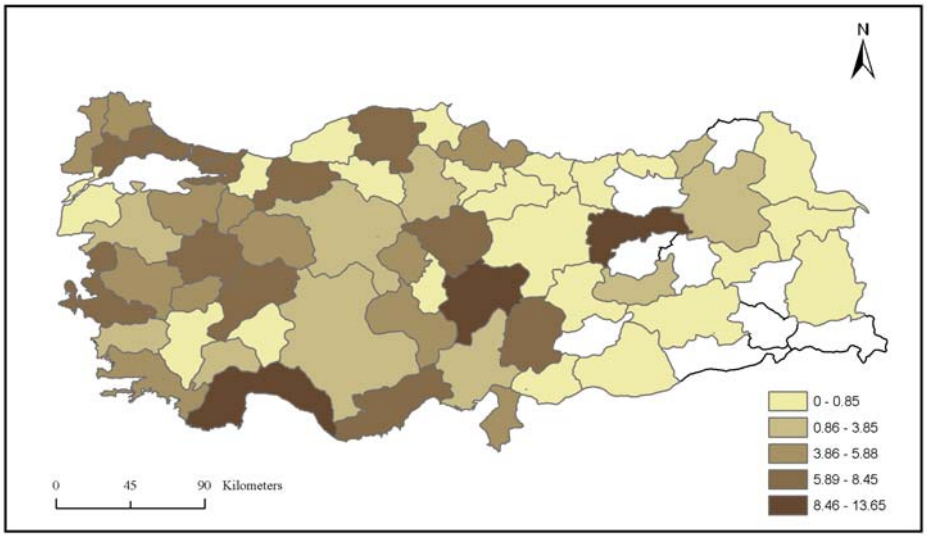

Figure B.4. Firm Birth Rates Calculated Using Ecological Approach across 58 Provinces, 1990
(Number of new SMEs in manufacturing per 100 esrtablishments)

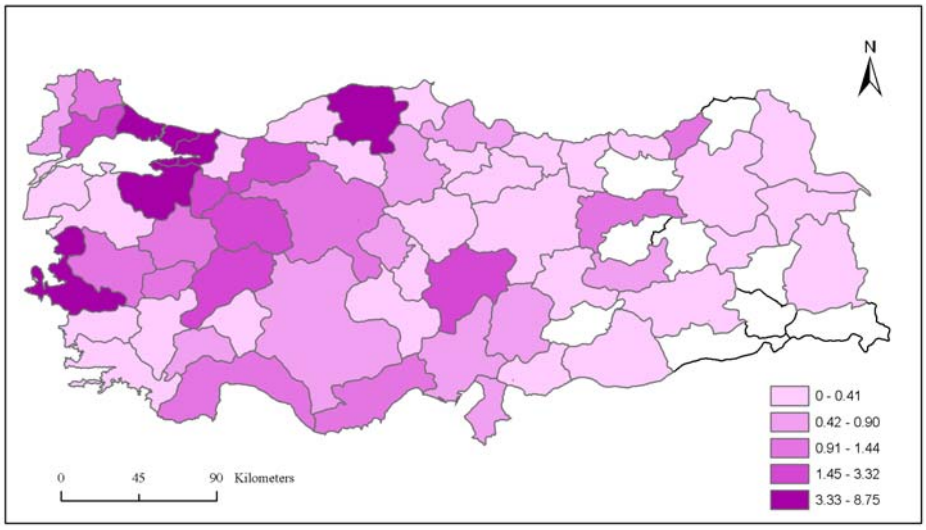

Figure B.5. Firm Birth Rates Calculated Using Labor Market Approach across 58 Provinces, 1990
(Number of new SMEs in manufacturing per 100 000 individuals in the labor force)
(provinces in white on the maps are ignored in the analyses due to lack of reliable data)

APPENDIX C

MATRICES OF CORRELATION COEFFICIENTS

Table C.1. Correlation Matrix of Dependent and Independent Variables, 1985

variables	grosslab	grossest	grgdp	grpop	popden	immig	**popedu**	**poptech**	unemp	grunemp	estsize	popent	grdep	govin
grosslab	1.0000													
grossest	0.1150	1.0000												
grgdp	0.0791	-0.2863	1.0000											
grpop	0.3079	-0.1589	0.0473	1.0000										
popden	0.7739	-0.0552	0.0270	0.3573	1.0000									
immig	0.3038	-0.1841	-0.1036	0.3833	0.2966	1.0000								
popedu	0.6576	-0.1906	0.0902	0.3808	0.5957	0.4793	1.0000							
poptech	0.6319	-0.2249	0.1733	0.3217	0.5203	0.4680	**0.9614**	1.0000						
unemp	0.3060	-0.1672	-0.0298	0.6249	0.3465	0.3509	0.5418	0.5533	1.0000					
grunemp	0.0299	0.0111	-0.1155	0.1567	0.0492	0.0140	-0.0209	-0.0707	0.0976	1.0000				
estsize	-0.1716	0.5704	-0.1632	0.0441	-0.0646	-0.0320	-0.1540	-0.1777	0.0941	-0.1228	1.0000			
popent	0.7485	-0.1679	0.0632	0.3820	0.7337	0.4941	**0.9538**	**0.8923**	0.4655	-0.0450	-0.1546	1.0000		
grdep	0.0719	0.2270	0.3079	-0.1637	-0.1092	-0.0735	-0.0458	-0.0425	-0.2245	-0.2307	0.0033	-0.0820	1.0000	
govin	0.2852	-0.1717	0.1169	0.4157	0.3443	0.1543	0.5746	0.5222	0.4847	-0.1462	-0.0386	0.5244	-0.0261	1.0000

Table C.2. Correlation Matrix of Dependent and Independent Variables, 1986

variables	grosslab	grossest	grgdp	grpop	popden	immig	**popedu**	**poptech**	unemp	grunemp	estsize	popent	grdep	govin
grosslab	1.0000													
grossest	0.3144	1.0000												
grgdp	0.0464	0.1220	1.0000											
grpop	0.2970	-0.0344	-0.0913	1.0000										
popden	0.7224	0.0284	-0.0307	0.3611	1.0000									
immig	0.3603	-0.1152	-0.0015	0.3833	0.2985	1.0000								
popedu	0.5826	-0.1303	0.0669	0.3760	0.5975	0.4627	1.0000							
poptech	0.5705	-0.1676	0.1014	0.3142	0.5200	0.4534	**0.9578**	1.0000						
unemp	0.2211	-0.1325	-0.1436	0.6198	0.3435	0.3432	0.5209	0.5288	1.0000					
grunemp	-0.0916	-0.0526	-0.1177	0.1567	0.0493	0.0140	-0.0218	-0.0796	0.2116	1.0000				
estsize	-0.0735	0.4195	0.0506	0.0735	-0.0469	0.0944	-0.1358	-0.1462	0.1109	-0.1345	1.0000			
popent	0.6930	-0.0988	0.0737	0.3839	0.7395	0.5037	**0.9496**	**0.8886**	0.4473	-0.0411	-0.1374	1.0000		
grdep	0.2473	-0.1809	0.0391	0.2588	0.2690	0.2472	0.3189	0.3904	0.2526	0.1572	0.0084	0.2829	1.0000	
govin	0.4764	-0.0373	0.1197	0.4198	0.5826	0.1970	0.6905	0.6090	0.4177	-0.1100	-0.1235	0.6910	0.2069	1.0000

Table C.3. Correlation Matrix of Dependent and Independent Variables, 1987

variables	grosslab	grossest	grgdp	grpop	popden	immig	**popedu**	**poptech**	unemp	grunemp	estsize	popprot	grdep	govin
grosslab	1.0000													
grossest	0.3751	1.0000												
grgdp	0.0618	0.0703	1.0000											
grpop	0.3433	-0.0833	-0.3831	1.0000										
popden	0.8207	0.1108	0.0041	0.3388	1.0000									
immig	0.5221	-0.0397	0.0634	0.5140	0.4200	1.0000								
popedu	0.6053	-0.0011	0.1055	0.3347	0.5847	0.5948	1.0000							
poptech	0.5694	0.0024	0.1371	0.2961	0.5071	0.5855	**0.9636**	1.0000						
unemp	0.2813	-0.0317	-0.0494	0.3766	0.3117	0.2821	0.4815	0.4905	1.0000					
grunemp	-0.0241	0.1614	-0.2739	0.2890	-0.0718	-0.1196	-0.1642	-0.1710	0.1164	1.0000				
estsize	-0.0352	0.0399	-0.1257	-0.0233	-0.0486	0.0597	-0.1120	-0.1057	0.1599	-0.0275	1.0000			
popent	0.7350	0.0402	0.0780	0.3714	0.7385	0.6282	**0.9485**	**0.8901**	0.4082	-0.1694	-0.1292	1.0000		
grdep	-0.1883	0.1997	0.1702	-0.3368	-0.1306	-0.3399	-0.2057	-0.1629	-0.1697	0.0373	-0.2216	-0.2261	1.0000	
govin	0.5665	0.0277	0.0366	0.3400	0.6008	0.2921	0.7184	0.6268	0.4025	-0.0258	-0.1365	0.7367	-0.1692	1.0000

Table C.4. Correlation Matrix of Dependent and Independent Variables, 1988

variables	grosslab	grossest	grgdp	grpop	popden	immig	**popedu**	**poptech**	unemp	grunemp	estsize	popprot	grdep	govin
grosslab	1.0000													
grossest	0.5661	1.0000												
grgdp	-0.0850	0.1083	1.0000											
grpop	0.4605	0.2435	0.2071	1.0000										
popden	0.8119	0.2383	-0.0550	0.3435	1.0000									
immig	0.6155	0.2852	0.0021	0.5469	0.4160	1.0000								
popedu	0.6089	0.1854	0.0142	0.3324	0.5708	0.5731	1.0000							
poptech	0.5467	0.1461	-0.0116	0.2823	0.4930	0.5532	**0.9684**	1.0000						
unemp	0.1967	-0.0013	0.1923	0.3679	0.2782	0.2349	0.4362	0.4457	1.0000					
grunemp	-0.1758	-0.1025	0.3255	0.2890	-0.0697	-0.0962	-0.1679	-0.1786	0.1967	1.0000				
estsize	-0.0362	0.0042	-0.0876	0.0143	-0.0478	0.0465	-0.0985	-0.0904	0.2022	-0.0421	1.0000			
popent	0.7411	0.2304	0.0229	0.3644	0.7316	0.5968	**0.9461**	**0.8909**	0.3650	-0.1630	-0.1327	1.0000		
grdep	0.0909	-0.0608	0.0158	0.3387	0.0724	0.3745	0.1055	0.1185	0.1985	0.0779	-0.0093	0.0963	1.0000	
govin	0.5791	0.1962	-0.0493	0.3427	0.6365	0.3295	0.7480	0.6669	0.4009	-0.0600	-0.1146	0.7688	0.0494	1.0000

Table C.5. Correlation Matrix of Dependent and Independent Variables, 1989

variables	grosslab	grossest	grgdp	grpop	popden	immig	**popedu**	**poptech**	unemp	grunemp	estsize	popprot	grdep	govin
grosslab	1.0000													
grossest	0.5829	1.0000												
grgdp	-0.2677	-0.2321	1.0000											
grpop	0.2192	-0.0821	0.1195	1.0000										
popden	0.5963	-0.0144	-0.1572	0.3479	1.0000									
immig	0.2624	-0.1599	-0.1728	0.5027	0.3393	1.0000								
popedu	0.3852	-0.1352	-0.2497	0.3294	0.5551	0.4832	1.0000							
poptech	0.3421	-0.1505	-0.3132	0.2685	0.4776	0.4554	**0.9725**	1.0000						
unemp	-0.0220	-0.0834	-0.0519	0.3547	0.2435	0.2323	0.3871	0.3985	1.0000					
grunemp	-0.2518	-0.0779	0.2341	0.2890	-0.0679	-0.0635	-0.1717	-0.1855	0.2737	1.0000				
estsize	-0.1516	-0.1725	0.0835	-0.0077	-0.0562	0.0819	-0.1091	-0.1006	0.2038	-0.0592	1.0000			
popent	0.4704	-0.1444	-0.2110	0.3570	0.7275	0.4878	**0.9415**	**0.8892**	0.3193	-0.1596	-0.1452	1.0000		
grdep	0.0361	0.1189	0.2651	0.4632	0.0447	-0.1352	0.0280	0.0010	0.1424	0.4017	-0.1155	0.0542	1.0000	
govin	0.4930	-0.0307	-0.1631	0.3622	0.8654	0.3090	0.6450	0.5520	0.2271	-0.1104	-0.1310	0.7727	0.1348	1.0000

Table C.6. Correlation Matrix of Dependent and Independent Variables, 1990

variables	grosslab	grossest	grgdp	grpop	popden	immig	**popedu**	**poptech**	unemp	grunemp	estsize	popprot	grdep	govin
grosslab	1.0000													
grossest	0.5318	1.0000												
grgdp	0.0317	0.1221	1.0000											
grpop	0.2276	0.2675	-0.1009	1.0000										
popden	0.5883	0.1095	-0.0104	0.3525	1.0000									
immig	0.4224	0.4575	0.0545	0.5027	0.3418	1.0000								
popedu	0.4750	0.2740	-0.0457	0.3254	0.5385	0.4890	1.0000							
poptech	0.4442	0.2631	-0.0529	0.2542	0.4616	0.4564	**0.9757**	1.0000						
unemp	0.0033	-0.0275	-0.2417	0.3389	0.2079	0.2020	0.3346	0.3493	1.0000					
grunemp	-0.2122	-0.0157	-0.2949	0.2890	-0.0656	-0.0635	-0.1757	-0.1915	0.3464	1.0000				
estsize	-0.0431	-0.0017	-0.0908	0.0405	-0.0629	0.1474	-0.0789	-0.0655	0.2189	-0.0358	1.0000			
popent	0.5765	0.2390	-0.0904	0.3506	0.7183	0.4793	**0.9357**	**0.8869**	0.2722	-0.1531	-0.1139	1.0000		
grdep	0.0429	0.2180	0.1244	0.0386	-0.0429	0.0847	0.1370	0.0625	-0.1104	-0.0737	0.0198	0.0934	1.0000	
govin	0.4531	0.0958	-0.0263	0.4041	0.7985	0.2821	0.5986	0.5071	0.2514	-0.0712	-0.1306	0.7091	0.1918	1.0000

APPENDIX D

RESULTS OF CROSS-SECTION DATA ANALYSIS

Table D.1.1. Results of OLS Regression Analysis for the Years 1985-1990

(The dependent variable, GROSSLAB, is identified as the number of new firms per 100000 individuals in the labor force)

	1985	1986	1987	1988	1989	1990
GRGDP	-0.31	-0.007	0.02	-0.005	-0.06	-0.002
	-1.134	-0.229	0.562	-0.616	-1.485	-0.052
GRPOP	0.26	0.27	-0.04	0.27	0.10	0.03
	1.108	1.069	-0.279	**1.955**	0.438	0.178
POPDEN	0.009	0.008	0.008	0.007	0.01	0.005
	3.305	**2.653**	**4.035**	**3.911**	**3.310**	**1.798**
IMMIG	-0.45	0.13	0.50	0.79	0.12	0.46
	-1.156	0.314	1.169	**2.240**	0.303	1.387
POPEDU	-1.18	-1.04	-0.80	-0.39	0.61	-0.58
	-1.882	**-1.746**	**-1.921**	-0.894	0.899	-0.917
POPTECH	1.33	1.20	0.69	0.17	-0.47	0.61
	2.243	**1.973**	**1.718**	0.390	-0.599	0.821
UNEMP	-0.08	-0.28	-0.06	-0.09	-0.19	-0.13
	-0.400	-1.469	-0.520	-0.772	-1.172	-0.920
GRUNEMP	0.06	-0.008	0.06	-0.07	-0.15	-0.05
	0.962	-0.124	1.284	-1.374	**-1.786**	-0.692
ESTSIZE	-0.001	0.0008	0.0009	0.0003	-0.003	-0.0002
	-0.659	0.270	0.429	0.145	-0.888	-0.052
POPENT	4.68	3.35	2.72	2.27	-1.48	2.07
	1.963	1.328	1.536	1.318	-0.594	1.028
GRDEP	0.09	-0.009	-0.003	-0.03	0.06	0.01
	2.581	-0.340	-0.483	-1.189	1.156	0.521
GOVIN	-0.09	0.02	0.08	0.03	-0.22	-0.07
	-0.849	0.157	0.850	0.804	-1.354	-0.519
Constant	-2.56	-1.78	-1.94	-0.37	3.64	-0.33
	-1.907	-1.260	**-2.048**	-0.403	**2.188**	-0.248
R^2, %	75	64	76	80	50	48
Adjusted R^2, %	68	54	69	75	36	34
F(12,45)	11.07*	6.65*	11.64*	14.88*	3.68*	3.42*

The table presents the coefficients with t-ratios below, bold if significant at 0.10 level, $t_{(45)} \approx 1.68$ at 0.10 level

* significancant at 0.10 level, $F_{(12,45)} = 1.71$ at 0.10 level

Table D.1.2. Results of the OLS Regression Analysis for the years 1985-1990 without the Independent Variable POPEDU

(The dependent variable, GROSSLAB, is identified as the number of new firms per 100000 individuals in the labor force)

	1985	1986	1987	1988	1989	1990
GRGDP	-0.018	0.003	0.026	-0.006	-0.055	-0.005
	-0.665	0.107	0.590	-0.658	-1.362	-0.171
GRPOP	0.224	0.234	-0.032	0.261	0.134	0.0002
	0.920	0.913	-0.217	**1.921**	0.569	0.001
POPDEN	0.010	0.009	0.009	0.008	0.011	0.006
	4.149	**3.467**	**4.851**	**4.451**	**3.200**	**2.015**
IMMIG	-0.358	0.238	0.533	0.779	0.123	0.4486
	-0.910	0.549	1.207	**2.224**	0.304	1.357
POPTECH	0.484	0.433	0.114	-0.139	0.105	0.023
	1.219	1.005	0.415	-0.497	0.232	0.061
UNEMP	-0.089	-0.272	-0.085	-0.094	-0.181	-0.137
	-0.453	-1.378	-0.765	-0.833	-1.119	-0.971
GRUNEMP	0.0181	-0.043	0.060	-0.0683	-0.147	-0.051
	0.327	-0.714	1.242	-1.353	**-1.789**	-0.684
ESTSIZE	-0.001	-0.0001	0.0008	0.0002	-0.003	-0.0002
	-0.816	-0.051	0.336	0.072	-0.840	-0.058
POPENT	1.296	0.388	0.497	1.315	-0.187	1.027
	0.806	0.203	0.361	0.975	-0.092	0.619
GRDEP	0.069	-0.002	-0.003	-0.025	0.057	0.007
	2.109	-0.082	-0.414	-1.153	1.058	0.248
GOVIN	-0.154	-0.053	0.029	-0.004	-0.182	-0.085
	-1.479	-0.467	0.306	-0.041	-1.160	-0.662
Constant	-0.851	-0.244	-1.056	0.083	2.731	0.441
	-0.837	-0.216	-1.239	0.108	**2.071**	0.421
R^2, %	73	62	74	80	49	47
Adjusted R^2, %	66	52	67	75	36	34
F(11,46)	11.14*	6.68*	11.68*	16.24*	3.95*	3.66*

The table presents the coefficients with t-ratios below, bold if significant at 0.10 level, $t_{(46)} \approx 1.68$ at 0.10 level

* significancant at 0.10 level, $F_{(11,46)} = 1.73$ at 0.10 level

Table D.1.3. Results of the OLS Regression Analysis for the Years 1985-1990 without the Independent Variables POPEDU and POPENT

(The dependent variable, GROSSLAB, is identified as the number of new firms per 100000 individuals in the labor force)

	1985	1986	1987	1988	1989	1990
GRGDP	-0.023	0.003	0.024	-0.004	-0.056	-0.009
	-0.892	0.104	0.558	-0.425	-1.457	-0.332
GRPOP	0.261	0.243	-0.036	0.262	0.135	0.007
	1.097	0.972	-0.243	**1.929**	0.578	0.040
POPDEN	0.012	0.010	0.009	0.009	0.011	0.007
	6.632	**4.986**	**6.820**	**6.745**	**3.507**	**2.843**
IMMIG	-0.306	0.268	0.581	0.869	0.116	0.469
	-0.792	0.665	1.390	**2.570**	0.295	1.439
POPTECH	0.753	0.506	0.193	0.080	0.068	0.229
	3.509	**2.191**	1.160	0.487	0.313	1.261
UNEMP	-0.1436	-0.286	-0.094	-0.119	-0.178	-0.157
	-0.781	-1.549	-0.863	-1.084	-1.132	-1.152
GRUNEMP	0.0169	-0.0425	0.059	-0.0718	-0.147	-0.049
	0.307	-0.698	1.230	-1.428	**-1.808**	-0.667
ESTSIZE	-0.001	-0.0001	0.0007	-0.00006	-0.003	-0.0004
	-0.822	-0.049	0.292	-0.024	-0.844	-0.126
GRDEP	0.069	-0.004	-0.003	-0.027	0.057	0.009
	2.097	-0.171	-0.471	-1.263	1.066	0.346
GOVIN	-0.138	-0.047	0.043	0.032	-0.187	-0.073
	-1.356	-0.433	0.500	0.348	-1.261	-0.580
Constant	-1.246	-0.367	-1.135	-0.189	2.785	0.146
	-1.405	-0.388	-1.392	-0.266	**2.384**	0.158
R^2, %	72	61	74	79	49	46
Adjusted R^2, %	66	53	68	75	38	35
F(10,47)	12.28*	7.50*	13.08*	17.78*	4.44*	4.05*
HETTEST[1] $\chi^2(1)$	0.68	5.85**	10.43**	13.36**	3.20**	1.11

The table presents the coefficients with t-ratios below, bold if significant at 0.10 level,
$t_{(47)} \approx 1.68$ at 0.10 level

* significancant at 0.10 level, $F_{(10,47)} = 1.76$ at 0.10 level
** significant at 0.10 level, $\chi^2(1) = 2.71$ at 0.10 level

[1] Cook-Weisberg test for heteroscedasticity

Table D.1.4. Results of Cross-Section Data Analysis with Robust Standard Errors for the Years 1985-1990

(The dependent variable, GROSSLAB, is identified as the number of new firms per 100000 individuals in the labor force)

	1985	1986	1987	1988	1989	1990
GRGDP	-0.023	0.003	0.024	-0.004	-0.056	-0.009
	-0.931	0.090	0.649	-0.524	**-2.249**	-0.688
GRPOP	0.261	0.243	-0.036	0.262	0.135	0.007
	1.125	1.060	-0.229	**1.890**	0.553	0.035
POPDEN	0.012	0.010	0.009	0.009	0.011	0.007
	10.017	**4.649**	**5.662**	**6.433**	**4.680**	**4.741**
IMMIG	-0.306	0.268	0.581	0.867	0.116	0.469
	-0.938	0.578	0.987	1.468	0.488	1.337
POPTECH	0.753	0.506	0.193	0.081	0.068	0.229
	3.517	**2.583**	1.064	0.476	0.406	1.420
UNEMP	-0.144	-0.286	-0.094	-0.119	-0.178	-0.157
	-0.847	**-1.838**	-1.014	-1.044	-1.294	-1.607
GRUNEMP	0.0169	-0.043	0.059	-0.072	-0.147	-0.049
	0.302	-0.604	1.219	-1.386	-1.315	-1.033
ESTSIZE	-0.001	-0.0001	0.0007	-0.00006	-0.003	-0.0004
	-1.589	-0.036	0.223	-0.029	-0.974	-0.212
GRDEP	0.069	-0.004	-0.003	-0.027	0.057	0.009
	2.364	-0.179	-0.594	-1.148	1.309	0.725
GOVIN	-0.138	-0.047	0.043	0.032	-0.187	-0.073
	-1.836	-0.286	0.339	0.278	-1.391	-0.857
Constant	-1.246	-0.367	-1.135	-0.189	2.785	0.146
	-1.793	-0.345	-1.367	-0.218	**2.176**	0.134
R^2, %	72	62	74	79	49	46
F(10,47)	54.77*	11.53*	26.06*	29.21*	38.80*	51.23*

The table presents the coefficients with t-ratios below, bold if significant at 0.10 level, $t_{(47)} \approx 1.68$ at 0.10 level

* significancant at 0.10 level, $F_{(10,47)} = 1.76$ at 0.10 level

Table D.2.1. Results of OLS Regression Analysis for the years 1985-1990

(The dependent variable, GROSSEST, is identified as the number of new firms per 100 establishments in manufacturing)

	1985	1986	1987	1988	1989	1990
GRGDP	-0.301	0.066	0.056	0.029	-0.323	0.038
	-2.815	0.655	0.366	1.104	**-2.339**	0.641
GRPOP	-0.008	0.472	-0.299	0.412	-0.238	0.274
	-0.009	0.532	-0.576	0.943	-0.277	0.740
POPDEN	0.006	0.006	0.005	0.002	0.007	0.0008
	0.763	0.907	1.047	0.526	0.645	0.169
IMMIG	-2.472	-1.272	.1616	1.375	-0.325	1.501
	-1.554	-0.889	0.109	1.265	-0.224	**2.200**
POPTECH	0.699	0.124	0.1100	-0.317	-1.398	0.461
	0.792	0.150	0.187	-0.597	**-1.730**	1.215
UNEMP	-0.845	-0.818	-0.195	-0.246	0.344	-0.294
	-1.117	-1.248	-0.510	-0.694	0.592	-1.029
GRUNEMP	0.273	0.140	0.265	-0.157	-0.375	0.096
	1.204	0.649	1.569	-0.970	-1.248	0.619
ESTSIZE	0.036	0.035	0.006	0.001	-0.017	-0.001
	5.314	**3.507**	0.804	0.198	-1.274	-0.175
GRDEP	0.383	-0.128	0.030	-0.085	0.316	0.076
	2.837	-1.387	1.240	-1.226	1.605	1.341
GOVIN	-0.225	0.091	0.014	0.194	-0.242	-0.194
	-0.537	0.236	0.048	0.654	-0.442	-0.737
Constant	3.841	4.35	0.231	4.482	18.278	0.648
	1.052	1.294	0.080	**1.959**	**4.238**	0.334
R^2, %	53	28	12	19	21	29
Adjusted R^2, %	43	13	-7	2	5	14
F(10,47)	5.32*	1.85*	0.64	1.11	1.27	1.95
HETTEST[2] $\chi^2(1)$	11.96**	12.57**	16.23**	1.09	8.98**	0.13

The table presents the coefficients with t-ratios below, bold if significant at 0.10 level, $t_{(47)} \approx 1.68$ at 0.10 level

* significancant at 0.10 level, $F_{(10,47)} = 1.76$ at 0.10 level
** significant at 0.10 level, $\chi^2(1) = 2.71$ at 0.10 level

[2] Cook-Weisberg test for heteroscedasticity

Table D.2.2. Results of Cross-Section Data Analysis with Robust Standard Errors for the Years 1985-1990

(The dependent variable, GROSSEST, is identified as the number of new firms per 100 establishments in manufacturing)

	1985	1986	1987	1988	1989	1990
GRGDP	-0.301	0.066	0.056	0.029	-0.329	0.038
	-2.192	0.491	0.324	1.308	**-2.679**	0.676
GRPOP	-0.008	0.472	-0.299	0.412	-0.238	0.274
	-0.008	0.631	-0.449	0.840	-0.301	0.783
POPDEN	0.006	0.006	0.005	0.002	0.007	0.0008
	1.926	**1.718**	**1.867**	0.756	0.786	0.226
IMMIG	-2.472	-1.272	0.162	1.375	-0.325	1.501
	-2.192	-1.384	0.120	1.367	-0.411	**2.578**
POPTECH	0.699	0.124	0.110	-0.317	-1.398	0.461
	1.210	0.256	0.271	-0.671	**-2.160**	1.322
UNEMP	-0.845	-0.818	-0.195	-0.246	0.344	-0.294
	-1.258	-1.239	-0.563	-0.745	0.568	-1.064
GRUNEMP	0.273	0.140	0.265	-0.157	-0.375	0.096
	1.322	0.639	1.710	-0.911	-1.103	0.710
ESTSIZE	0.0360	0.035	0.006	0.001	-0.017	-0.001
	2.711	**1.876**	0.553	0.240	-1.252	-0.204
GRDEP	0.383	-0.128	0.030	-0.085	0.316	0.076
	3.238	-1.391	0.748	-1.362	1.623	1.167
GOVIN	-0.225	0.091	0.014	0.194	-0.242	-0.194
	-0.691	0.337	0.065	0.678	-0.476	-0.911
Constant	3.841	4.352	0.231	4.482	18.278	0.648
	1.319	1.307	0.076	**1.802**	**3.653**	0.376
R^2, %	53	28	12	19	21	29
F(10,47)	3.03*	0.91	1.81*	2.81*	1.29	3.11

The table presents the coefficients with t-ratios below, bold if significant at 0.10 level, $t_{(47)} \approx 1.68$ at 0.10 level

* significancant at 0.10 level, $F_{(10,47)} = 1.76$ at 0.10 level

APPENDIX E

RESULTS OF VARIANCE INFLATION FACTOR (VIF*) ANALYSIS

le E.1.1. VIF Values for 1985

Variable	VIF	1/VIF
popedu	50.91	0.019643
popprot	28.09	0.035600
poptech	21.40	0.046739
popden	3.34	0.299281
unemp	2.76	0.362544
grpop	2.15	0.465051
govin	1.97	0.507750
immig	1.61	0.619506
grgdp	1.44	0.695995
grunemp	1.35	0.742871
grdep	1.31	0.763491
estsize	1.16	0.858883
Mean VIF	9.79	

Table E.1.2. VIF Values for 1986

Variable	VIF	1/VIF
popedu	40.38	0.024764
popprot	25.74	0.038849
poptech	20.87	0.047926
popden	3.79	0.263636
govin	2.79	0.358924
unemp	2.76	0.362060
grpop	2.08	0.481498
immig	1.71	0.583708
grdep	1.52	0.657648
grunemp	1.47	0.681328
estsize	1.26	0.791624
grgdp	1.17	0.854703
Mean VIF	8.79	

Table E.1.3. VIF Values for 1987

Variable	VIF	1/VIF
popedu	39.82	0.025116
popprot	25.34	0.039460
poptech	17.60	0.056809
popden	3.54	0.282758
govin	3.00	0.333359
immig	2.75	0.363022
grpop	2.43	0.410942
unemp	1.74	0.576142
grgdp	1.44	0.696150
grdep	1.31	0.760467
grunemp	1.30	0.769146
estsize	1.26	0.796331
Mean VIF	8.46	

Table E.1.4. VIF Values for 1988

Variable	VIF	1/VIF
popedu	43.96	0.022747
popprot	23.81	0.042007
poptech	20.84	0.047984
popden	3.62	0.276168
govin	3.39	0.295046
immig	2.58	0.387191
grpop	2.02	0.493923
unemp	1.84	0.543379
grunemp	1.40	0.715581
grgdp	1.29	0.774218
grdep	1.29	0.776112
estsize	1.21	0.829399
Mean VIF	8.94	

Table E.1.5. VIF Values for 1989

Variable	VIF	1/VIF
popedu	46.49	0.021509
poptech	26.99	0.037048
popprot	22.00	0.045461
popden	5.81	0.172210
govin	5.76	0.173700
grpop	2.54	0.393288
immig	2.15	0.464976
grdep	1.90	0.525769
unemp	1.68	0.595270
grunemp	1.53	0.652159
grgdp	1.38	0.725904
estsize	1.22	0.820843
Mean VIF	9.95	

Table E.1.6. VIF Values for 1990

Variable	VIF	1/VIF
popedu	54.77	0.018260
poptech	32.53	0.030737
popprot	19.66	0.050863
popden	4.97	0.201047
govin	4.11	0.243371
grpop	1.90	0.525183
immig	1.82	0.550520
unemp	1.80	0.555025
grunemp	1.61	0.622637
grdep	1.43	0.701417
grgdp	1.26	0.793304
estsize	1.24	0.803647
Mean VIF	10.59	

Table E.2.1. VIF Values for 1985

Variable	VIF	1/VIF
popprot	12.11	0.082549
poptech	9.06	0.110398
popden	2.91	0.343347
unemp	2.76	0.362972
grpop	2.13	0.468702
govin	1.77	0.563724
immig	1.59	0.628754
grgdp	1.35	0.742919
grdep	1.22	0.818773
grunemp	1.19	0.841981
estsize	1.15	0.866412
Mean VIF	3.39	

Table E.2.2. VIF Values for 1986

Variable	VIF	1/VIF
popprot	14.11	0.070896
poptech	9.93	0.100660
popden	3.28	0.304834
unemp	2.76	0.362511
govin	2.45	0.407876
grpop	2.06	0.484533
immig	1.68	0.595119
grdep	1.49	0.672264
grunemp	1.31	0.761397
estsize	1.22	0.819419
grgdp	1.13	0.887698
Mean VIF	3.77	

Table E.2.3. VIF Values for 1987

Variable	VIF	1/VIF
popprot	14.52	0.068882
poptech	7.78	0.128469
popden	3.12	0.320069
govin	2.76	0.362955
immig	2.75	0.363536
grpop	2.43	0.411292
unemp	1.70	0.586922
grgdp	1.44	0.696527
grdep	1.31	0.761158
grunemp	1.30	0.769154
estsize	1.25	0.797852
Mean VIF	3.67	

Table E.2.4. VIF Values for 1988

Variable	VIF	1/VIF
popprot	14.69	0.068073
poptech	8.10	0.123433
popden	3.24	0.308614
govin	3.04	0.329320
immig	2.58	0.387429
grpop	2.02	0.494970
unemp	1.83	0.545658
grunemp	1.40	0.716112
grgdp	1.29	0.775741
grdep	1.29	0.777687
estsize	1.20	0.835145
Mean VIF	3.70	

Table E.2.5. VIF Values for 1989

Variable	VIF	1/VIF
popprot	14.67	0.068178
poptech	9.06	0.110432
govin	5.36	0.186739
popden	5.15	0.194294
grpop	2.49	0.400928
immig	2.15	0.464976
grdep	1.87	0.533483
unemp	1.67	0.597689
grunemp	1.53	0.652161
grgdp	1.34	0.744782
estsize	1.21	0.823528
Mean VIF	4.23	

Table E.2.6. VIF Values for 1990

Variable	VIF	1/VIF
popprot	13.40	0.074648
poptech	8.38	0.119372
popden	4.79	0.208716
govin	4.02	0.248741
grpop	1.83	0.545521
immig	1.81	0.551246
unemp	1.80	0.556545
grunemp	1.61	0.622688
grdep	1.29	0.776577
estsize	1.24	0.803681
grgdp	1.24	0.806534
Mean VIF	3.76	

Table E.3.1. VIF Values for 1985

Variable	VIF	1/VIF
poptech	2.66	0.375431
unemp	2.43	0.411813
grpop	2.06	0.486081
govin	1.71	0.584500
immig	1.55	0.646079
popden	1.48	0.674477
grgdp	1.27	0.790316
grdep	1.22	0.819292
grunemp	1.19	0.842606
estsize	1.15	0.866420
Mean VIF	1.67	

Table E.3.2. VIF Values for 1986

Variable	VIF	1/VIF
poptech	2.92	0.342570
unemp	2.45	0.408042
govin	2.27	0.439696
grpop	2.00	0.499073
popden	1.75	0.571000
immig	1.48	0.673894
grdep	1.28	0.779470
grunemp	1.28	0.781726
estsize	1.22	0.819526
grgdp	1.13	0.888075
Mean VIF	1.78	

Table E.3.3. VIF Values for 1987

Variable	VIF	1/VIF
poptech	2.89	0.345635
immig	2.51	0.399073
grpop	2.42	0.413019
govin	2.30	0.434518
popden	1.77	0.564418
unemp	1.63	0.611785
grgdp	1.42	0.705382
grunemp	1.29	0.773241
grdep	1.29	0.775092
estsize	1.23	0.813064
Mean VIF	1.88	

Table E.3.4. VIF Values for 1988

Variable	VIF	1/VIF
poptech	2.84	0.351586
govin	2.61	0.382461
immig	2.40	0.415998
grpop	2.02	0.495002
popden	1.85	0.541343
unemp	1.74	0.575343
grunemp	1.39	0.719855
grdep	1.27	0.786445
grgdp	1.21	0.828800
estsize	1.19	0.843292
Mean VIF	1.85	

Table E.3.5. VIF Values for 1989

Variable	VIF	1/VIF
govin	4.85	0.206001
popden	4.27	0.233923
grpop	2.49	0.401437
poptech	2.16	0.462462
immig	2.06	0.484296
grdep	1.87	0.534607
unemp	1.62	0.616200
grunemp	1.53	0.652175
grgdp	1.24	0.804673
estsize	1.19	0.837969
Mean VIF	2.33	

Table E.3.6. VIF Values for 1990

Variable	VIF	1/VIF
govin	3.93	0.254364
popden	3.34	0.299777
poptech	1.94	0.514181
grpop	1.83	0.547655
immig	1.79	0.557362
unemp	1.70	0.587702
grunemp	1.60	0.623513
grdep	1.26	0.793936
estsize	1.23	0.812895
grgdp	1.17	0.856133
Mean VIF	1.98	

APPENDIX F

POPULATION DENSITY AND FIRM BIRTH RATES BY PROVINCES

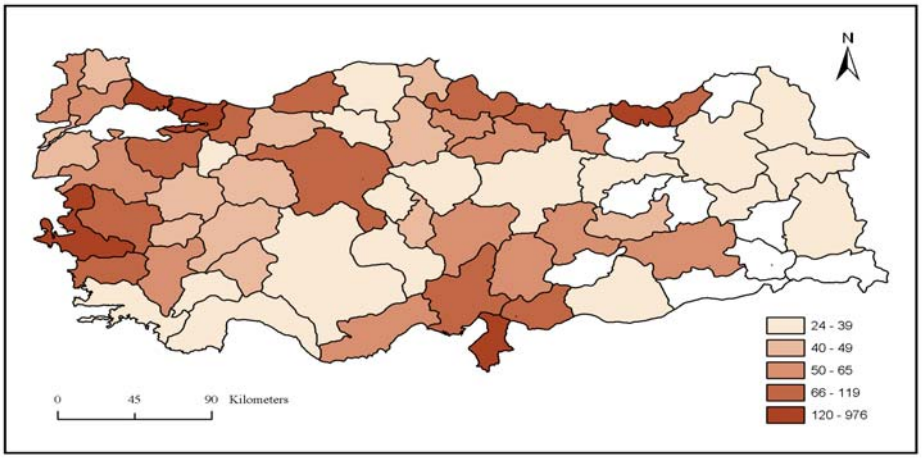

Figure F.1. Population Density by Provinces in Turkey, 1985

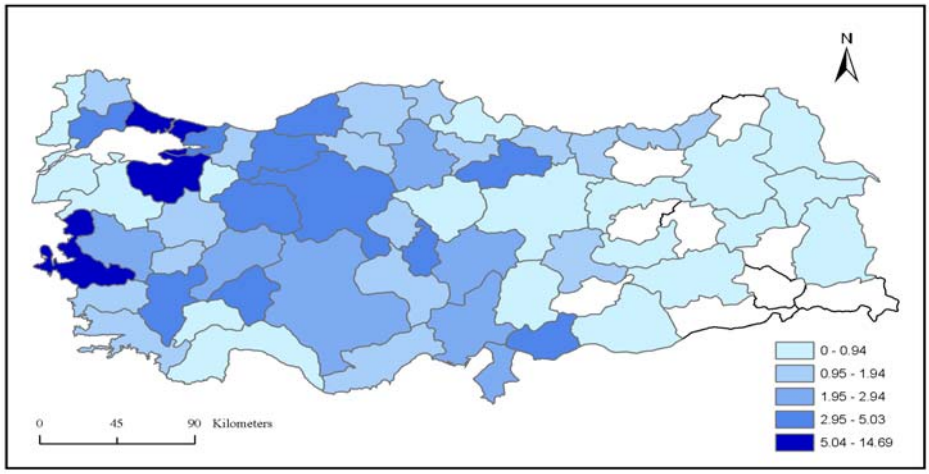

Figure F.2. Firm Birth Rates Calculated Using Labor Market Approach across Provinces, 1985
(Number of new SMEs in manufacturing per 100 000 individuals in the labor force)

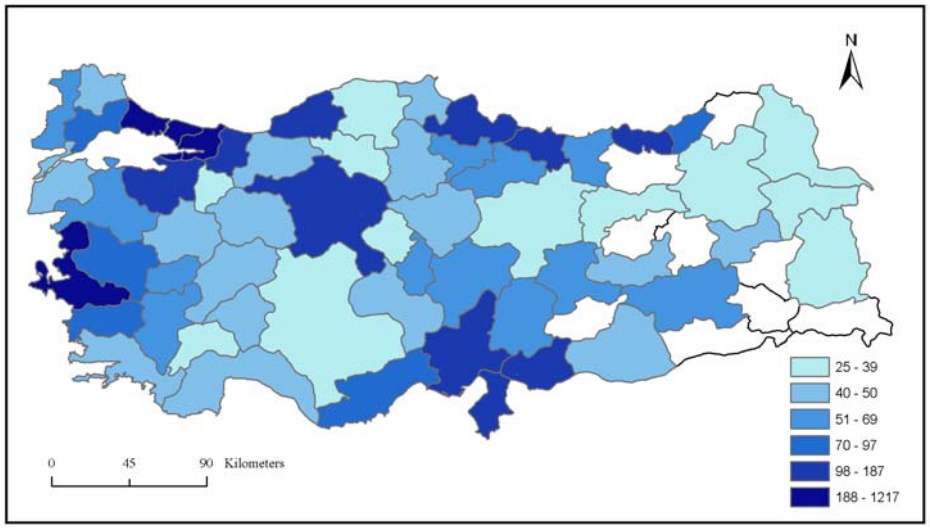

Figure F.3. Population Density by Provinces in Turkey, 1990

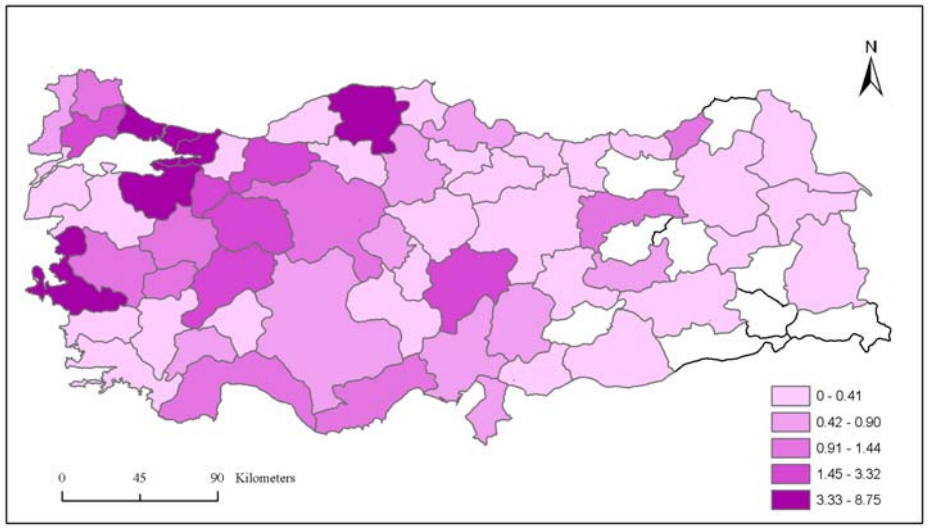

Figure F.4. Firm Birth Rates Calculated Using Labor Market Approach across Provinces, 1990
(Number of new SMEs in manufacturing per 100 000 individuals in the labor force)

APPENDIX G

RESULTS OF PANEL DATA ANALYSIS

Table G.2. Results of Panel DataFGLS Estimation

Variable	Coefficient*
GRGDP	-0.002
	-0.628
GRPOP	0.122
	4.010
POPDEN	0.009
	11.309
IMMIG	-0.026
	-0.243
POPTECH	0.349
	7.383
UNEMP	-0.167
	-6.713
GRUNEMP	0.002
	0.142
ESTSIZE	-0.0004
	-0.957
GRDEP	-0.957
	-0.018
GOVIN	-0.047
	-2.369
Constant	-0.307
	-1.739

* z values in paranthesis