RISK-SHARING AND INDUSTRIAL SPECIALIZATION: THE CASE OF UKRAINE

by

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Abstract

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This thesis defines and examines the link between risk sharing and industrial specialization on the basis of the regional information which is something that has not been done for Ukraine. Since regions have different specialization it is interesting to see how specialization is insured against shocks. It is especially important in the case of Ukraine because the economic conditions are volatile, economic and political changes happen very often and the economy is not stable. The obtained results are mostly consistent with the theory, economic and sociologic interpretation and logic.

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Chapter 1

INTRODUCTION

The benefits of industrial specialization are well established in the literature. According to the classical theory specialization likely leads to an increase in welfare and therefore growth of the economy - the pattern of specialization is determined by factor endowments. Using comparative advantage, that is specializing in producing goods that the country does better than the others, the country affects its welfare and long-term growth rate (see Krugaman and Obstfeld 'International Economics: Theory and Policy' 2006). The issue was tested on different economies and different time periods. But this theory does not take into account a very important factor – uncertainty.

It has been shown that high level of specialization that leads to higher variance of the GDP together with uninsured production risk may bring an overall welfare loss. Brainard and Cooper (1968) were the first who incorporated risk and uncertainty into classical theory framework. A group of authors suggested that after introducing the concepts of uncertainty and risk aversion the trade theory (such as law of comparative advantages and Hecksher-Ohlin theory) turns out to be wrong.

How this risk that is due to the specialization under uncertainty can be eliminated? Helpman and Razin (1978) have argued that trade in assets can eliminate production risk and specialization will resurface. They demonstrated this concept on a two-sector, one consumer and small-country economy. The main assumptions of the model state that firms and physical factors are owned by consumers; equity can be traded in the domestic market or abroad as well. Small open economy and international trading in equity and

commodities lead to the situation where the economy faces state-dependent prices for commodities and securities while factor prices are determined in the country. In the same way prices for the securities are determined in the country when international trading in security market is not allowed.

Acemouglu and Zilibotti (1997) stress that developing countries have fewer opportunities to diversify their production and tend to specialize in safe technologies. Insurance permits them to take risks that – with some probability – will translate into an economic take-off. In Greenwood and Jovanovich (1990) financial intermediaries pool risks and help achieve higher and safer returns on investment.

This paper aims to discover a link between risk sharing and industrial specialization in Ukraine on the basis of the regional data which is something that has not been done for Ukraine. In order to find out how different factors influence the Ukraine's interregional specializations level, we are going to run the OLS regression with index of specialization as a dependent variable. An instrumental variable approach is going to be used to deal with endogeneity problem.

To do the analysis, we use a well documented dataset from the statistical yearbook of Ukraine as well as from the website of the National Bank of Ukraine. The monthly dataset covers 25 regions in Ukraine and two cities, Kiev and Sevastopol, for the 2001-2004 time period.

The paper proceeds as follows: in the second chapter we give a brief description of main studies related to the topic, summarize the results and conclusions of these papers. During the third chapter, we introduce and discuss methodology that will be used for estimating the important relationships. In the fourth chapter, the discussion on the necessary data is presented, we also provide a reader with all characteristics and peculiarities of the dependent and independent variables. Also, based on the literature review here we give brief and preliminary expectations about the explanatory power

of the variables. Fifth chapter presents a detailed discussion about the results alongside with their economic interpretation. Chapter six delivers to the reader the main outcomes of the paper, importance of this research and its further possible implications. Other interesting and important outcomes are reflected in the appendices.

Chapter 2

LITERATURE REVIEW

A lot of attention has been drawn to the question of the benefits and drawbacks of industrial specialization in recent years. Numerous scientists have tried to assess the nature of the effect of the specialization on the economic growth. As a result of those trying we have a number of research and working papers. All research came through the following development path:

a. industrial specialization leads to economic growth in any case
b. industrial specialization with uninsured production risk may entail a welfare loss
c. insured production risk resurface the benefits of industrial specialization

The theoretical framework for the connection between specialization and economic growth was firstly introduced by Ricardo in 1817. He developed a new conceptual theory that played influential role in further development of economic thought. One of the main points of this work was an introduction of the so-called comparative advantage concept into the international trade theory. This issue says that country has a comparative advantage in producing a good if the opportunity cost of producing this good in terms of other goods is lower in this country than it is in the other countries.

Using a simple two- countries model with one factor of production Ricardo showed that when two countries specialize in production of the goods in which they have comparative advantage, both countries gain from trade.

However, further research demonstrated that specialization in production may make economy more exposed to shocks (Prebisch, 1950, Singer 1950). So the theoretical trade literature needed to incorporate some uncertainty which is due to shocks into its framework.

The concept of uncertainty in the classical trade theory was initially proposed by Brainrd and Cooper in 1968. Authors refuse the assumptions of pure theory of international trade about mobility of resources and knowledge about future. Using a simple two commodities model they showed how the classical model can be modified to take uncertainty into account. They offered a possible solution for avoiding potential losses from specialization under lack of perfect knowledge, diversification of production.

One more solution to this problem was introduced by Helpman and Razin in 1978. In their model that consists of a two-sector, one consumer and small-country economy individuals trade equities (domestically and internationally) so they insure production risk through trade in assets. Economists describe two main issues that face the economy. These are the problems of choosing the optimal portfolio and consumption. For a given distribution of technological parameters, commodity, equity and production factors prices, firms and individuals maximize their profits and utilities by choosing optimal portfolio before uncertainty. After the state of the world is realized, the economy solves the consumption problem. Although this paper gives only a basic view of the international risk sharing issue based on the assumption of internationally integrated equity markets, it has consequences for the theory of economic growth.

According to Greenwood and Jovanovic (1990) investment markets are full of financial intermediaries and they achieve higher and safer return on investment by pooling risks. Zilibotti (1997) showed the difference between developing and developed countries by mentioning that developing countries have fewer opportunities to diversify their production. Developing countries

also choose to specialize in a safe technology. Feeney (1999) further develops Zilibotty's paper by introducing the following idea: if the countries have learning-by-doing policy in production, specialization may bring much better result during transition period.

2.1 The measure of insurance

Uncertainty in production can be measured [or smoothed] by the level of insurance. This insurance can take many forms. The most obvious ones are the insurance against natural disaster or the markets where goods can be sold at fixed price in the future. But what other types of insurance can lower losses due to idiosyncratic shocks? Classical literature defines income insurance done via the internationally or interregional diversified investment portfolio as the main mechanism of insurance against idiosyncratic uncertainty.

It is important to learn how different measures of insurance can be achieved on the international and interregional level. From the abovementioned theory one can conclude that in the case when idiosyncratic risk is fully distributed among members, individual's consumption will be affected only by aggregate fluctuations but not by idiosyncratic shocks such as job loss or sickness. Some researchers did explore the alleged connection in separate countries. For example, Cochrane (1991) and Mace (1991) used micro-data from the US to explore the characterization of full risk sharing and their empirical results rejected full risk-sharing hypothesis. Obstfeld (1994) tested this hypothesis on the macro level among G7 countries and his findings also reject it. So rejection of the perfect (full) risk sharing hypothesis was confirmed by many empirical findings and some authors decided to measure the amount of risk sharing that is achieved through various channels.

Asdrubali, Sorensen and Yosha (1996) defined three main channels of securing insurance on the interregional level. The most appropriate way consists in the idea that individuals can insure their income against potential losses by diversifying their investment portfolios via cross-ownership of

productive asset. The next good channel of smoothing the income fluctuation is a tax-transfer system. Authors also mentioned that individuals from a particular region can smooth their consumption via adjusting their portfolio, for example by lending or borrowing in the national credit market. Authors demonstrated that in the US about 40% of shocks to gross state product smoothed via capital markets; federal government smoothes 13% of shocks via taxes, transfers and grant to states.

Melitz and Zumer (1999) extend this methodology and show that risk sharing also depends on country-specific (or state-specific) features such as demographics, wealth and size. They tested this using the regional data of the US, France and Canada. They found essential amounts of risk sharing via different channels in all countries and rejected full risk sharing hypothesis.

In addition to quantitative measurement of the level of risk sharing, Becker and Hoffmann (2002) showed dynamic aspects of risk sharing. They found that the permanent shocks insured (ex-ante) while transitory shocks are mainly smoothed (ex-post) via saving behavior.

2.2 Determinants of industrial specialization

One of the main aims of this paper is to estimate the link between industrial specialization and insurance in Ukraine. Before doing this let's go back to the history and see what has been done so far about the measurement of specialization, determinants of specialization and its influence on economic growth.

Many authors already define main determinants of the level of industrial specialization. One of the main factors that affect the degree of regional specialization is the volume of interregional trade. Harrigam and Zakrajsec (2000) mentioned that "economist won't be able to understand trade until they understand specialization". Authors provide evidence for the importance of factors endowments in determining specialization patterns.

The main idea is very intuitive: the coal-rich regions may specialize in metallurgy while agriculture regions in food or light industry. Another important factor is distance to other regions.

Harris (1954) empirically tested the influence of different variables on the level of specialization. Among these variables he included distantness factor: for each country he calculated the distantness as a sum of the distances between two capital cities weighted by GDP. His results confirm theoretical prediction: countries that lie far away from their trade partners are less specialized than those that located closely to their partners.

Krugman (1991) in his famous work showed the influence of population of the region on its trade. Author found that sign of this influence is not obvious. His considerations are based on the basis of transportation costs. It is logically, that high-transportation cost firms are located in the regions that have high population density. This, is turn, may increase congestion costs. As a result, firms with low transportation costs might find it more attractive to operate in the less populated areas and the overall effect on specialization, therefore, is going to be uncertain.

Of course, industrial specialization depends on the country's level of economic growth. Some empirical evidence about this issue was showed by Imbs and Wacziarg (2003). The main finding is that the industrial specialization declines with GDP at earlier stage of the development and increases with GDP at later stages of the development.

We will partly follow the procedures described by Kalemi-Ozcan, Sorensen and Yosha (2003), who particularly use the methodologies described above to find empirical evidence about interconnection of industrial specialization and insurance. This research has not been done for Ukraine so far and it would be useful to check whether the relationship between insurance and industrial

specialization holds for the transition country. A simple sketch of our approach is as follows:

a. Calculate the degree of insurance among regions (oblast) in Ukraine;
b. Calculate an index of industrial specialization for each region;
c. Compare the level of specializations with the degree of insurance;
d. Check how degree of insurance between regions is associated with level of specialization of these regions;
e. Check how this dependence changed over time.

Chapter 3

METHODOLOGY

Theoretical framework

We refer to the recent methodology suggested by Kalemi-Ozcan, Sorensen and Yosha (2003, KSY hereafter). The authors presented a theoretical framework that shows the effect of production insurance, distantness, and population densities on specializations of regions, and defined the measurement of risk-sharing and indexes of specialization.

KSY provide very useful insights into determination of the risk-sharing which are fairly intuitive. They consider a region with production that exhibits increasing returns to scale and a consumer that has a risk-averse utility. In order to even-out regional fluctuations, two possible mechanisms are possible. KSY perform the analysis for different countries and for different states within USA as well.

The first one is "income insurance". It means that in a region where GDP reduces because of some external shock - natural disaster, for example - personal income falls down less rapidly than GDP because a part of the personal income which residents receive comes from abroad or from different regions within the country. This type of insurance is effective for both permanent and transitory types of shocks. The relationship could be described by the following equation:

$$y_t = \beta_{t1} GDP_t + \varepsilon_t \qquad (1)$$

where y_t is per capita personal income, GDP_t is a GDP level at time t, the coefficient β_{t1} shows relationship between these two variables: if personal income is not insured (that is, it fully depends on region's GDP fluctuation), the coefficient β_{t1} is equal to 0. We are going to use coefficient $\beta_{t2} = 1 - \beta_{t1}$ because it measures the fraction of the idiosyncratic GDP shocks that is absorbed through interregional income insurance. Of course, it will be better to use GNP instead personal income because GNP includes also corporate savings. But this data is not available on regional level in Ukraine so we will use personal income as the determinant of the level of income insurance.

The second mechanism is the so called "consumption insurance". Suppose that GDP falls down, and the income of the residents goes down as well. As a result, consumers review their expenses and savings. If the shock is permanent, they try to use their wealth in order to keep appropriate consumption. The measurement of this risk is analogous to the previous case. We consider a similar relationship:

$$c_t = \beta_{t3} GDP_t + \varepsilon_t \tag{2}$$

where c_t is the consumption of individuals at time t, coefficient β_{t3} gives the estimated value of the consumption insurance. This type of insurance can smooth only transitory shocks. Facing an income shock inhabitants of a region will adjust their stock of wealth in order to maintain their level of consumption only if the income shock is perceived as transitory.

Now, let us consider a specialization index. The index of specialization of region *i* shows the difference between the vector of sector shares in region *i* and the vector of shares in the other regions:

$$SPEC_i = \sum_{s=1}^{S} \left(\frac{GDP_i^s}{GDP_i^M} - \frac{1}{J-1} \sum_{j \neq i} \frac{GDP_j^s}{GDP_j^M} \right)^2 \tag{3}$$

where GDP_i^s is the GDP of manufacturing subsector *s* in region i , GDP_i^M is the total GDP of a particular region *i*, *M* is the number of sectors and *J* is the number of regions. We define five sectors in which Ukrainian regions may specialize – mining, agriculture, manufacturing, energy producing, transport & communications, hotel and restaurants. There are 27 regions in our sample – 24 oblasts, Autonomous Republic of Crimea, Kyiv and Sevastopol.

Empirical method

Referring to the framework proposed by Kalemi-Ozcan, Sorensen and Yosha we use the following model for estimating the effect of risk-sharing on industrial specialization:

$$\begin{aligned} LogSPEC_i &= \beta_0 + \beta_1 IncIns_i + \beta_2 ConsIns_i + \beta_3 PopDens_i + \\ &+ \beta_4 LogDist_i + \beta_5 LogPop_i + + \beta_6 miGDP_i + \beta_7 agGDP_i + \\ &+ \beta_8 maGDP_i + \beta_9 epGDP_i + \beta_{10} tcGDP_i + \beta_{11} hrGDP_i + \varepsilon_i \end{aligned} \quad (4)$$

where $LogSPEC_i$ is the index of specialization of the region i, $IncIns_i$ and $ConsIns_i$ are income and consumption insurances respectively for the region *i*;

Many other variables play important role in the defining the level of specialization. We include the following variables in order to guard against omitted variable bias:

$PopDens_i$ - population density for the region i;

$LogDist_i$ - logarithm of the distantness function for the region i;

$LogPop_i$ - logarithm of the population of the region i;

$miGDP_i$ - shares of the mining sector in the total GDP of the region i;

$agGDP_i$ - shares of the agriculture sector in the total GDP of the region i;

$maGDP_i$ -shares of the manufacturing sector in the total GDP of the region i;

$epGDP_i$ - shares of the energy producing sector in the total GDP of the region i;

$tcGDP_i$ - shares of the transport & communications sector in the total GDP of the region i;

$hrGDP_i$ - shares of the hotel and restaurants in the total GDP of the region i.

We include GDP shares of several industries because we believe that these variables influence the interregional trade volumes. That is, regions with specific resources are more likely to specialize in a specific production.

We are going to use region's distance (sum of the distances from the region's capital city to the other regions' capital cities) variable weighted by the GDP share of the other regions) and we expect this variable to have a positive impact on the specialization index. Variable "distantness" is the GDP weighted averages of the distances between capital cities of all regions:

$$DIS_i = \sum_j d_{ij} \frac{GDP_j}{GDP_{i+j}} \tag{5}$$

where d_{ij} - is a distance between capital cities of the regions *i* and *j*, GDP_i - output of the region *i* in the period *t*, GDP_{i+j} - total output of the group and *j* is a number of the regions (cities).

The population density and region's area are also important factors in the estimating of the industrial specialization so we include these two variables as well.

Expected results

Income insurance shows how regions are insured against production risks (in both consumption and income cases). According to the theory described above, we expect the sign of the coefficients to be positive.

The issue of the sign of the coefficient on distantness is controversial. On the one hand, some authors argue that the location of industries is affected by transportation costs, e.g. the firm's cost minimization strategy leads to locating high transportation cost industries in the populated areas. On the other hand, low-transportation cost firms tend to locate in the low population density areas (Krugman (1991)). These different views lead to some uncertainty about the sign of the coefficient.

According to the empirical evidence by Hummels and Levinsohn (1995), estimated trade costs are higher in the countries that are far away from their trading partners. We expect negative sign of this coefficient.

The region-by-region shares of different sectors are expected to have positive signs. For example, region endowed by coal (mining sector) might specialize in coal mining more than the one without coal endowment. Then manufacturing in related industries tend to agglomerate in areas rich in natural resources. These shares do not enter the dependent variable because our Index of specialization is the composite index (see formula (3)). Thus, naturally, all these variables have positive effect on specialization

There might be endogeneity problem within this relationship. Causality may run in the opposite direction: the need for insurance may arise from the specialized regional production structure. So when we estimate our model the coefficients will be probably biased.

To guard against the potential problem, we are going to employ instrumental variable approach. The basic idea of this method is to use variables that are

highly correlated with the dependant variable and that do not exhibit causal relationship from specialization variable to instrument. There are several indicators of investor protection proposed by La Porta at al. (1997, 1998) which could be used as instruments. Alternative approach is to choose time-averaged GDP share of financial services, insurance and real estate (FIRE) as the instrument for our insurance indicators.

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Chapter 4

DATA DESCRIPTION

State Committee of Statistics (SCS) of Ukraine provides GDP data by industries for all regions since 1998. The data for 5 years (2001-2005) is available for 12 aggregated industries. For the years 2000 and 1998 (1999 is missing), the classification is slightly different, and only seven industries correspond to the ones in 2001-2005.

We are going to use six major industry specializations: mining, agriculture, manufacturing, energy producing, transport & communications, hotel and restaurants. Statistics on population, areas and distances is also available in the Statistical Yearbook of Ukraine. The classification of industries is the same as that for FDI. In general, we have monthly data for 5 year period across 25 regions plus for Kiev and Sevastopol'.

Distance and area don't vary by month at all. But GDP shares do vary by month as there is different level of production every month. Summary statistics of variables that will be used in our model are provided in Table 1.

Table 1. Summary Statistics of the Explanatory Variables

Variable		Measurement	# of obs	Mean	Std. Dev.
Shares of the GDP subsectors	Agriculture	Mln. hrn.	135	2805.1	1306.2
	Mining	Mln. hrn.	135	1095.5	2229.1
	Manufacturing	Mln. hrn.	135	9734.9	12711.7
	Energy producing	Mln. hrn.	135	1149.6	1239.9
	Transport & Communications	Mln. hrn.	135	2330.6	3144.3
	Hotel and restaurants	Mln. hrn.	135	157.7	217.2

GDP per capita	hrn. per cap	1620	1029.8	633.6
Income per capita	hrn. per cap	1620	401.7	191.5
Consumption per capita	hrn. per cap	1620	334.9	176.6
Area	Th. Sq. km	27	22.3	8.8
Population	Thousand person	135	1779.9	914.3
Distances	km	300	7888.2	3195.3
Financial Activities of the regions	Mln. hrn.	135	705.6	1529.9

Chapter 5

EMPIRICAL EVIDENCE

Following the discussed procedure of calculating the income insurance and consumption insurance we estimate our model. In order to estimate level of income insurance and level of consumption insurance we run 54 OLS regressions for each region, 27 for each index[1]. For that we use monthly time series over 5 years. All insurance coefficients turned out to be statistically significant at 1% level.

To calculate the specialization index, we use GDP series of each region averaged over five years. According to the theory, more specialized regions must have higher insurance. Table 2 contains information on five most specialized and five least specialized regions. The results are very interesting and quite intuitive. We can notice a clear geographical pattern in the specialization within Ukraine. As we can see, eastern Ukraine and Kiev city tend to be most specialized, while mostly only western regions are among the least specialized regions.

Table 2 also highlights an important statistical relationship: high-specialization is associated with higher insurance level. For example, the top two specialized regions in Ukriane, Zaporizka and Donetska oblasts, whose specializations are 0.721 and 0.680 respectively, tend to have the highest income and consumption insurance indexes. For the least specialized region, Lvivska oblast, the income insurance coefficient is almost twice less than for the highest specialized regions in Ukraine. These results might suggest that income and consumption of western Ukrainians are more vulnerable that that of eastern citizens. In other words, income and consumption is better insured

[1] 24 regions, ARK Krym, Kyiv and Sevastopol.

against idiosyncratic shocks only in particular regions rather than in the others. Estimated insurance coefficients and specialization index are shown in Appendix A.

Table 2. Income Insurance Level, Consumption Insurance Level and Specialization Indices in Ukraine.

Region	Income Insurance ($100xb_2$)	Consumption Insurance ($100xb_4$)	Specialization (10xSPEC)
Zaporizka	70.28	77.93	0.721
Donetska	71.81	85.46	0.680
Kyiv	68.82	66.42	0.644
Luganska	64.96	82.54	0.649
Dnipropetrovska	65.79	76.84	0.516
Mykolajvska	54.67	69.24	0.47
Zakarpatska	42.74	46.09	0.43
Ivano-Frankivska	53.26	74.05	0.35
Kyivska	63.91	79.74	0.034
Lvivska	42.79	59.08	0.028

Notes: results for the top five and bottom five specialized regions are presented in the Table 2. Indexes are calculated using data over 5 year period, 1991-1995.

Insurance can take the form of, for example, cross-ownership of individuals when individuals of a particular region own assets in another region's company. It may also work via tax-system when individuals from the shocked regions are paid subsidies by the government. Finally, lending or borrowing in the national credit market that can be in the form of direct lending or borrowing as well as purchases of credit might be another way of insuring income and consumption.

It is interesting to see how the level of region's specialization depends on its insurance. To demonstrate this empirically we run Ordinary Least Squares regression using cross section data with specialization index as a dependent variable and insurance indexes and GDP shares of industrial sectors as explanatory variables. Estimated coefficients are shown in the Table 3.

Table 3. Regression Results, Index of Specialization as a Dependant Variable, Ordinary Least Squares.

Variable	Coefficient	p-value
Income Insurance	0.048*	0.093
Consumption Insurance	0.057	0.182
Population Density	2.49e-09**	0.021
Log-Distantness	-0.013**	0.043
Log- Population	-0.003	0.226
Mining GDP Share	-0.034	0.630
Agriculture GDP Share	-0.127*	0.072
Manufacturing GDP Share	0.078**	0.022
Energy Producing GDP Share	-0.019	0.783
Transport & Communications GDP Share	-0.053	0.562
Hotel and Restaurants GDP Share	-0.571	0.401

Notes: *, ** denote statistical significance at 10 and 5 percent level, respectively.

Results show that only five coefficients are statistically significant. The interpretations of the results are as follows:

1) Income insurance measure has a positive and significant influence on level of specialization at 10% level of significance. This means that moving from no insurance (income type, $b_2=0$) to perfect insurance ($b_2=1$) increases the specialization index by 4.8% of its range in our sample. This result supports the theory that tells us that diversification

of income that is what income insurance measures leads to an increase in specialization of the region where these individuals live.

2) Population density has a positive statistically significant effect. This result confirms the prediction that firms tend to locate in densely populated regions while sparsely populated regions do not seem to specialize in sectors with low transportation costs. The magnitude of the coefficient is very small though. It might partly come from the fact that Ukraine's population density is more homogeneous than, for example, the density of the states within United States of America. Interestingly, this coefficient is equal to 0.16 for the US, much higher than for Ukraine which confirms our hypothesis.

3) Log-distantness has a negative influence on the specialization index. Coefficient shows that increase in log weighted distantness by one unit leads to a decrease in specialization by 1.3%, on average.

4) The positive coefficient of the region-by-region GDP share of the manufacturing sector tells us that manufacturing in related industries tend to agglomerate in areas rich in raw materials needed for these industries. Increasing of this share by one unit leads to increasing of the level of specialization of particular region by 7.8%, on average. This result is quite intuitive: the more endowment the region has, the more specialized it would be in using that endowment.

5) The negative coefficient of the region-by-region GDP share of the agricultural sector tells us that agglomeration related to the agricultural industries does not take place in agricultural regions.

So far we estimated the relationship between insurance and specialization index using simple Ordinary Least Squares. The assumption that there is no endogeneity might not hold for the estimated regression because causality may run in the opposite direction: the need for insurance may arise from the specialized regional production structure. As a result, OLS estimators of all coefficients are inconsistent. The problem of an endogenous explanatory variable motivated the need for the instrumental variable approach.

To use the instrumental variable approach with insurance endogenous, we are going to find an observable variable that is not in equation (5) and which should satisfy two conditions. First, it should be uncorrelated with the error term. Second, the error of the linear projection of the endogenous variable (insurance in our case) on all the exogenous variables including the instrument should be uncorrelated with those exogenous variables. The second condition means that the instrument must be partially correlated with the endogenous variable after accounting for its relationship with the other exogenous variables.

We are going to use instruments proposed by La Porta at al. (1998). Authors provide eight different indicators as the instruments for the risk-sharing measures. However, due to availability of data we will be using one of the proposed instruments in our paper, the time-averaged GDP share of financial services as an instrument for the insurance indicators. Authors apply these instruments for countries as well as to different states within USA and we are going to use this approach to our estimating based on Ukrainian regional data. The results of the instrumental variable approach estimation are presented in Table 4.

Table 4. Regression results (Instrumental Variable Approach)

Variable	Coefficient	p-value
Income Insurance	0.052*	0.087
Consumption Insurance	0.062	0.147
Population Density	2.44e-09**	0.021
Log-Distantness	-0.009**	0.043
Log- Population	-0.004	0.193
Mining GDP Share	-0.041	0.630
Agriculture GDP Share	-0.164*	0.084
Manufacturing GDP Share	0.063**	0.021
Energy Producing GDP Share	-0.020	0.783
Transport & Communications GDP Share	-0.041	0.567
Hotel and Restaurants GDP Share	-0.619	0.395

Notes: *, ** denote statistical significance at 10 and 5 percent level, respectively.

The empirical results displayed in Table 4 are very similar to those which we obtained using simple OLS. Overall, the Instrumental Variable regression results support the conclusions of the OLS regression and suggest that there may be a causal relationship running from insurance to specialization. Coefficients become slightly higher in their magnitude and more statistically significant. For example, consumption insurance becomes significant at 15%-level.

Also it is interesting to see how the influence of the levels of insurance on specialization changed over time. To determine these changes we are going to perform the following procedure:

1) Divide out data sample into two sub-periods and estimate insurance indexes for each region in each period;

2) Calculate indexes of specialization for every region for these two periods;

3) Run two instrumental variable regressions in order to estimate the influence of the level of insurance on specialization for each period;

4) Compare estimated coefficient and make conclusions.

We divide our sample into two 30 months sub-periods. Estimated insurance coefficients are shown in Appendix 2. We also calculate specialization index based on the average information for these two sub-periods. In the Table 5 we show estimation results.

The key results show that the impact of the income insurance on level of specialization in Ukraine increases over time from 0.0493 to 0.0503. Of course, the magnitude of this change is not big and the reason might be the short span or our data, only five years. Therefore, as a suggestion for further research, it would be extremely useful to check whether this relationship holds for the longer time spans.

It has been measured in the literature how the risk-sharing and industrial specialization change over time in other economies. For example, Asdruballi et al. (1996) estimated risk-sharing between U.S. states over the period 1963-1990 and have found a significant increase of risk-sharing while specialization indices of each region have been slowly decreasing.

Table 5. Change in the Magnitude of the Impact of Insurance on Specialization Over Time (Instrumental Variable Approach), Two Sub-periods, 2001-mid 2003 and mid 2003 – 2005.

Variable	1st period	2nd period
	Coefficient (p-value)	Coefficient (p-value)
Income insurance	0.0493 * (0.091)	0.0501 * (0.088)
Consumption insurance	0.0577 (0.241)	0.0579 (0.227)
Population density	2.37e-09 * (0.084)	2.54e-09 (0.101)
Log-distantness	-0.0091** (0.032)	-0.0090* (0.065)
Log- population	-0.0046 (0.219)	-0.0031 (0.264)
Mining GDP share	-0.0420 (0.742)	-0.0333 (0.611)
Agriculture GDP share	-0.1094 ** (0.043)	-0.1834 * (0.072)
Manufacturing GDP share	0.0953 ** (0.034)	0.0842 ** (0.048)
Energy producing GDP share	-0.0170 (0.789)	-0.0195 (0.787)
Transport & Communications GDP share	-0.0661 (0.601)	-0.0501 (0.623)
Hotel and restaurants GDP share	-0.5284 (0.521)	-0.5355 (0.459)

Notes: *, ** denote statistical significance at 10 and 5 percent level, respectively.

Our results suggest that positive and significant increase in the impact of income risk-sharing on specialization level means that insurance move together with specialization over time.

Chapter 6

CONCLUSIONS

We provide a theoretical background and document empirical evidence on the relationship between risk-sharing and industrial specialization in Ukraine. The analysis has been done using regional data over 5 year period and the results suggest that insurance measures and index of specialization are positively related. It means that if the income and consumption are secured against idiosyncratic shocks, the regions are more likely to specialize. We demonstrate that this relationship is robust after controlling for other regressors that might affect specialization.

To deal with endogeneity problem - which means that causality may run in the opposite direction - we employ an instrumental variable approach. The results of instrumental variables regressions are consistent with a causal relationship running from risk sharing to industrial specialization.

There are several issues that have note been addressed in this study but might well contribute to further research on this topic. One of the potential questions is whether the results that we obtained for Ukraine hold for other transition countries. For instance, it would be interesting to see how the relationship between insurance and the level of specialization holds between countries of, for example, former Soviet Union or between Eastern and Central European countries in general. Moreover, since Ukraine considers joining the European Union, it would be useful to see how the relationship works between Ukraine and the EU countries as we know that the EU is one of the major trade partners of Ukraine.

Another issue that might contribute to the further research agenda is using data on other measures of risk-sharing or insurance which include, among

others, data on cross-ownership, tax transfers between regions in Ukraine, regional data on asset portfolios etc. We had difficulties in getting such data but it would be extremely useful to try it as the alternative measures of insurance.

Finally, after we have established a positive and significant relationship between insurance and the regional specialization, and using findings of the theoretical research that goes back to Ricardo 1817 and that has been discussed in our literature review section, one would like to test empirically the connection between specialization and economic growth in Ukraine.

BIBLIOGRAPHY

Acemoglu, Daron and Zilibotti, Fabrizio, "Was Prometheus Unbound by Chance? Risk, Diversification, and Growth", Journal of Political Economy, August 1997, 105(4), pp.709-751.

Asdrubali, Pierfederico; Sorensen, Bent E.; Yosha, Oved, "Channels of Interstate Risk Sharing: United States 1963-1990", The Quarterly Journal of Economics, Nov., 1996, Vol. 111, No. 4., pp. 1081-1110.

Brainard, William and Cooper, Richard, "Uncertainty and Diversification of International Trade", Food Research Institute Studies in Agricultural Economics, Trade, and Development, 1968, 8, pp.257-85.

Becker, S.O. and Hoffmann, "International Risk-Sharing in the Short Run and in the Long Run", mimeo., 2002, University of Munich and University of Dortmund.

Cochrane, John H., "A Simple Test of Consumption Insurance", The Journal of Political Economy, Oct., 1991, Vol. 99, No. 5, pp. 957-976.

Greenwood, Jeremy and Jovanovic, Boyan, "Financial Development, Growth, and the Distribution of Income", The Journal of Political Economy, Vol. 98, No. 5, Part 1 (Oct., 1990), pp. 1076-1107.

Feeney, J., "International risk sharing, learning by doing and growth", Journal of Development Economics, 1999, vol.58, pp.297-318.

Harrigan, James and Zakrajsec, Egon, "Factor Supplies and Specialization in the World Economy", National Bureau of Economic Research (Cambridge, MA), 2000, Working Paper No. 7848.

Harris, Chauncy D., "The Market as a Factor in the Localization of Industry in the United States", Annals of the Association of American Geographers, Dec.1954, №.44 (4), pp.315-348.

Helpman, Ethana and Razin, Assaf. A theory of international trade under uncertainty. New York: Academic Press, 1978

Hummels, David and Levinsohn, James, "Monopolistic Competition and International Trade: Reconsidering the Evidence', Quarterly Journal of Economics, August 1995, 110(3), pp.799-836.

Imbs, Jean and Wascziarg, Romain, "Stages of Diversification", American Economic Review, March 2003, 93 (1), pp.63-68.

Kalemli-Ozcan, Sebnem; Sørensen, Bent E.; Yosha, Oved, "Risk Sharing and Industrial Specialization: Regional and International Evidence', American Economic Review, Vol. 93, No. 3. (Jun., 2003), pp. 903-918.

Krugman, Paul. Geography and trade. Cambridge, MA: MIT Press, 1991

Krugman, Paul, Obstfeld M., "International Economics: Theory and Policy", 2006.

La Porta, Rafael; Lopez-de-Silanes, Florencio; Shleifer, Andrei and Vishny, Robert, "Legal Determinants of External finance", Journal of Finance, July 1997, 52(3), pp. 1131-50.

La Porta, Rafael; Lopez-de-Silanes, Florencio; Shleifer, Andrei and Vishny, Robert, "Law and finance", Journal of Political Economy, December 1998, 106(6), pp.113-55.

Mace, Barbara J., "Full Insurance in the Presence of Aggregate Uncertainty", The Journal of Political Economy, Oct., 1991, Vol. 99, No. 5., pp. 928-956.

Mélitz, Jacques; Zumer, Frédéric, "Interregional and International Risk Sharing and Lessons for EMU", Carnegie-Rochester Conference Series on Public Policy, Dec. 1999, 51, pp.149-188.

Obstfeld, Maurice, "Risk-Taking, Global Diversification, and Growth", The American Economic Review, Dec., 1994, Vol. 84, No. 5., pp. 1310-1329.

Prebisch, R., "Commercial Policy in the Underdeveloped Countries", The American Economic Review, 1950, 49 (2), pp. 251-273.

Singer, H.W, "U.S. Foreign Investment in Underdeveloped Areas: The Distribution of Gains between Investing and Borrowing Countries", The American Economic Review, 1950, 40(2), pp. 473-485.

APPENDIX A
Insurance indices and specialization between regions

#	Oblast	Income Insurance[2]	Consumption Insurance	Specialization Index
1	ARK Krym	0.46065	0.521803	0.014731305
2	Vinnytska	0.284212	0.518266	0.015677155
3	Volynska	0.537418	0.635861	0.009792566
4	Dnipropetrovska	0.657915	0.768389	0.050582299
5	Donetska	0.718068	0.854616	0.068020388
6	Zhytomyrska	0.342463	0.556707	0.010636046
7	Zakarpatska	0.427403	0.460909	0.004275923
8	Zaporizhska	0.702785	0.779256	0.072155887
9	Ivano-Frankivska	0.532577	0.740524	0.003464553
10	Kyivska	0.639156	0.79741	0.003374306
11	Kirovogradska	0.477837	0.668783	0.028298938
12	Luganska	0.649599	0.825373	0.063861411
13	Lvivska	0.427957	0.590832	0.002856594
14	Mykolajvska	0.546662	0.692449	0.004746374
15	Odeska	0.508196	0.56753	0.02934139
16	Poltavska	0.710418	0.831658	0.046843357
17	Rivnenska	0.462831	0.634783	0.01940943
18	Sumska	0.338744	0.629788	0.012541403
19	Ternopilska	0.188438	0.539693	0.025566129
20	Harkivska	0.590191	0.617598	0.00554784
21	Hersonska	0.308001	0.469072	0.005629982
22	Hmelnitska	0.302804	0.505967	0.020752823
23	Cherkaska	0.551093	0.679815	0.008633891
24	Chernivetska	0.127922	0.398534	0.027310447
25	Chernigivska	0.411801	0.622572	0.006766345
26	Kyiv	0.688124	0.664227	0.064374143
27	Sevastopol	0.393659	0.378731	0.047283645

[2] Income Insurance and Consumption Insurance indices are statistically significant at the 5% level.

APPENDIX B
Level of specialization between regions

#	Region	Year				
		2001	2002	2003	2004	2005
1	ARK Krym	0.0106	0.0186	0.0195	0.0134	0.0138
2	Vinnytska	0.0175	0.0162	0.0083	0.0160	0.0137
3	Volynska	0.0214	0.0187	0.0080	0.0063	0.0042
4	Dnipropetrovska	0.0677	0.0627	0.0595	0.0461	0.0441
5	Donetska	0.0646	0.0618	0.0730	0.0834	0.0694
6	Zhytomyrska	0.0142	0.0126	0.0061	0.0102	0.0081
7	Zakarpatska	0.0139	0.0145	0.0053	0.0014	0.0021
8	Zaporizhska	0.0688	0.0626	0.0809	0.0840	0.0742
9	Ivano-Frankivska	0.0025	0.0028	0.0057	0.0056	0.0037
10	Kyivska	0.0069	0.0084	0.0018	0.0026	0.0024
11	Kirovogradska	0.0368	0.0331	0.0233	0.0264	0.0213
12	Luganska	0.0760	0.0693	0.0680	0.0655	0.0627
13	Lvivska	0.0029	0.0028	0.0064	0.0033	0.0031
14	Mykolajvska	0.0062	0.0068	0.0103	0.0049	0.0033
15	Odeska	0.0337	0.0356	0.0428	0.0248	0.0271
16	Poltavska	0.0417	0.0578	0.0623	0.0477	0.0430
17	Rivnenska	0.0235	0.0243	0.0140	0.0152	0.0188
18	Sumska	0.0133	0.0132	0.0109	0.0126	0.0132
19	Ternopilska	0.0348	0.0368	0.0121	0.0210	0.0229
20	Harkivska	0.0039	0.0037	0.0076	0.0556	0.0027
21	Hersonska	0.0102	0.0090	0.0061	0.0063	0.0093
22	Hmelnitska	0.0230	0.0233	0.0110	0.0226	0.0199
23	Cherkaska	0.0106	0.0103	0.0093	0.0069	0.0080
24	Chernivetska	0.0318	0.0303	0.0146	0.0257	0.0294
25	Chernigivska	0.0102	0.0086	0.0027	0.0082	0.0058
26	Kyiv	0.0844	0.0746	0.0669	0.0599	0.0604
27	Sevastopol	0.0622	0.0563	0.0601	0.0448	0.0378

NOTES