From Communism to the European Union: A Case Study of Agricultural and Economic Development in Poland

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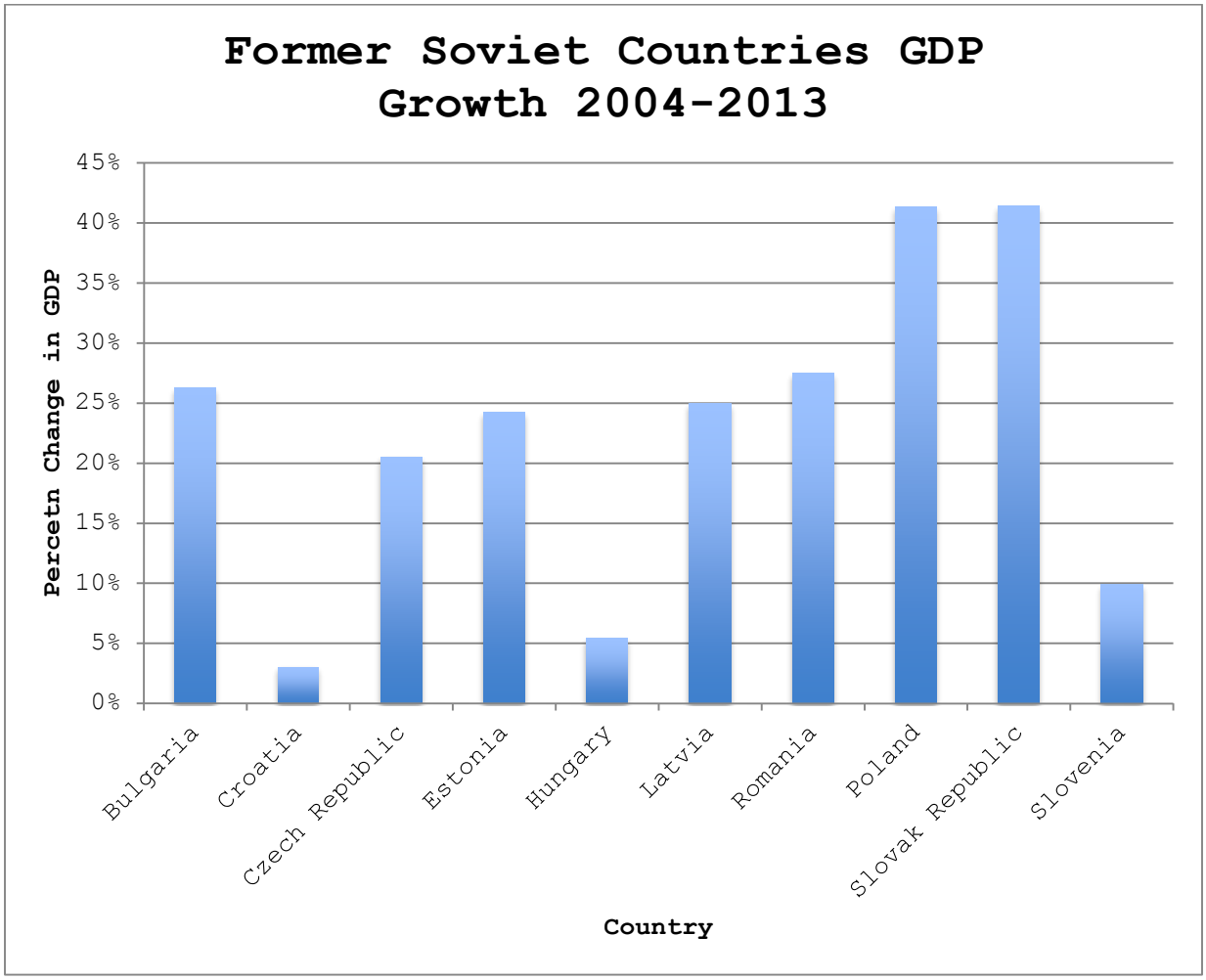
Abstract:

This paper explores the Poland's agricultural value added per worker as an indicator of economic success post-Soviet era and into its transition to the European Union. Holding GDP and other factors constant, our model shows that Poland's value added per worker is superior to most other countries in Europe. This success is attributed to Poland's private agricultural system, which was retained despite Soviet influence. We further conclude that countries that produce a high quantity of potatoes and rye, Poland's top crops, on average have lower value added per worker.

Introduction:

On May 1st, 2004, eight former Soviet Countries joined the European Union. In order to be admitted into the prestigious organization, countries must meet a set of legislative, economic, and social standards called the Copenhagen criteria (European Union 2015). Most nations had submitted their applications over a decade before-hand, but finally Poland had met all social and economic requirements to join the prestigious organization (Sheets 2012). While the simple acceptance into the European Union is impressive in it of itself, no nation has taken the call as seriously and successfully as Poland. Since joining, only the Slovak Republic has grown its GDP as much as Poland (see graph 1). Additionally, Poland was the only member of the European Union that avoided the recession in 2009, growing its GDP by 3%.

Graph 1.



Source: Data from the World Bank database. Retrieved November 19, 2015, from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&Type=TABLE#

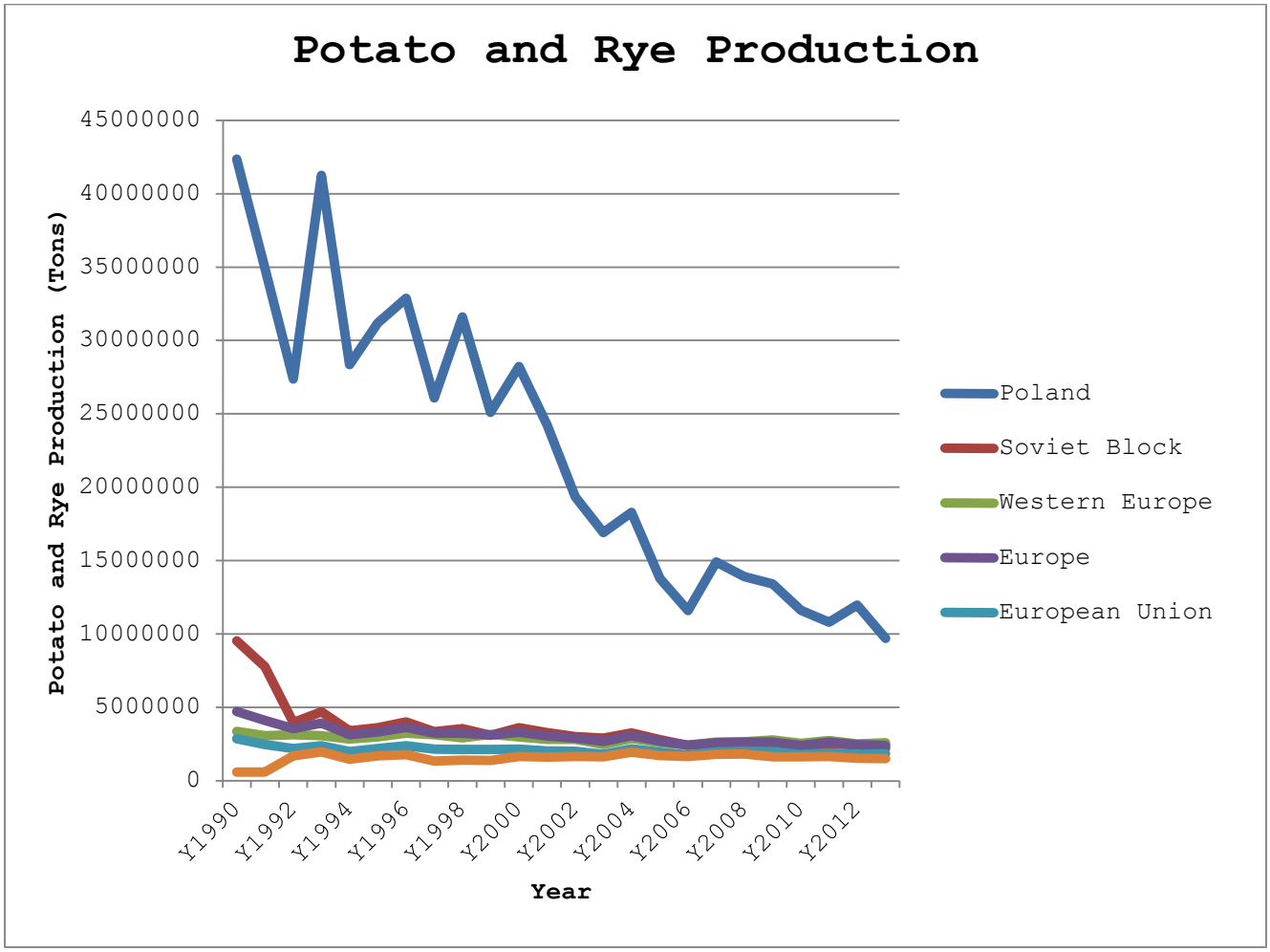
Poland rose from the ashes of the turmoil following the collapse and break up of the Soviet Union. Initiating shock therapy to transition to a market economy in 1990, the country experienced a severe economic downturn fueled by a deflation of Soviet-era pricing and frictional unemployment (Poznanski 2012); however, by 1995 the economy had rebounded and systematically started complying with each of the Copenhagen criteria. While there has been wide

speculation as to how Poland succeeded after the fall of communism when many others failed, few have explored a key unique component of Poland's economy during Soviet rule and its continued success today: agriculture. Despite being under the Soviet Union "sphere of influence," Poland was able to avoid many communist regulations (The Potsdam Conference, 1945). The most important of these regulations was the continued existence of the privatization of its agricultural system. Private ownership of land not only strengthened the Poland's agricultural system, but also eased the transition from the government control characteristic of communism to a market based economy.

Poland was not the only country to initially struggle in its market transition. All other former Soviet countries had to deal with the issues of transitioning from a political system that many call opposite of a free market system. This was especially prevalent in the transition from a public leasing or co-ownership system, as seen under communism, to a privatization. Many countries experienced push back, which slowed down the transition. For example in Hungary, additional laws to compensate families slowed down reform. A slow reform process leaves property rights uncertain which in turn reduces productivity. Poland was in the unique situation where all of their agriculture was already privatized. This ensured that time was not lost to messy reforms that were often swallowed by legal technicalities. This allowed Poland to focus its political efforts on finding solutions for other inefficiencies, such as introducing shock therapy and building a strong private sector outside of agriculture (Macours 2000).

The core of Poland's crop production, especially during the Soviet era, came from the potato. In recent years the country's production has significantly dropped, but it remains in the top 10 producers in the world (Potato Pro). Along with the potato, rye is also a staple of the Polish agricultural system. In graph 2, combined rye and potato production is compared to averages of Europe and Europe groupings (defined in the Data and Methodology section).

Graph 2.



This transition away from potato and rye production is not only a reaction to demand fluctuation, but an indicator of Poland's shift away from agriculture. While the private agricultural system provided a solid basis for Poland to transition to a market economy, once new opportunities were introduced to skilled private workers many citizens chose to expand their knowledge and work to other fields such as new private factories.

This paper analyzes the value added per worker of each European country compared to Poland from 1990 to 2013 as a vehicle to see if the former communist country was aided by their private agricultural system in transitioning to a market based economy and, ultimately, the European Union. Using a fixed effects model, other variables such as agriculture value added, GDP, and GDP per capita are used as a signal to control for high GDP countries already farther advanced than the Soviet block. Rye and potato production are used as a signal for Poland's strength in that crop and a general signal of the eastern block. A year dummy variable is used to view the effects over time of simple fluctuations in value added per worker from the base year of 1990.

Literature Review:

Market economies are more efficient than command and controlled economies (what the communist model utilizes) due to their ability to quickly react to changes in the market. Command economies have difficultly reacting to changes in demand and restrict prices of goods, which in turn pushes the supply below the market equilibrium (Sherman 1970). In addition to difficulties in price

setting and setting output levels, planned economies fail to accurately allocate inputs (Filer 2001). Direct evidence of this misallocation of inputs can be seen by the steep decline in fertilizer by Poland and several other central European countries from 1989 to 1995. These countries averaged a 15% decrease in fertilizer but crop output only decreased an average of 1.11% with some countries even increasing output (Macours 2000).

While the systematic inefficiencies from the command economy can be partially blamed for stunting Soviet nation, a lack of private firms also restricted economic growth. Private firms are more efficient due to the ease of transferability of ownership. Because of this, it is harder to identify poor management and penalize them. A prime example of efficiencies of a private firm can be found in the case of two Australian airlines, one public and the other private. Due to legislation, the airlines were almost identical in a variety of logistical characteristics, such as number of flights and take off times. Despite this similarities, the private firm always outperformed the public airline in measures of efficiency, like revenue per worker, passengers per employee, and tons of freight and mail carried per employee (Davies 1971). These firm level inefficiencies move their way up the market to a macroeconomic scale. When Poland first implemented its shock therapy, it had to devalue its currency by 31.6%. The price of goods (including food) plummeted leading to high unemployment (Prazmowska 2010).

In 1980 only 2% of Poland's total employment was private outside of agriculture. By 1990 that figure had risen to 16%. This was thanks to the

groundwork laid by the agricultural sector. This private sector saw its numbers decrease from 29% of total employment in 1970 to 22% in 1990. This was complemented by a decrease in socialized total employment from 68% to 62% in those same years. Those workers took skills from the private agricultural sector and translated them to the new flourishing private sector (Calvo 1992).

Data:

Our data comes from two sources, The World Bank and FAO statistics. The first is an online database collected by the World Bank, a collective of organizations striving to end poverty worldwide. By collecting data, the group is able to provide insight to struggling nations through their analytical work. In addition to providing this data to nations, they have their entire database online and available for free to the public. The World Bank collects this data by either communicating with a country or sending out their own employees to evaluate countries. The other portion of data comes from statistics provided by the Food Agriculture Organization (FAO). They gather agricultural data worldwide to help food security. Countries gather the data individually with instruction from the FAO.

From these databases we collected data from each country in Europe on value added per worker, agricultural value added, GDP, GDP per capita, potato production, and rye production from 1990-2013. The economic indicator variables are in constant 2005 US Dollars to prevent miscalculations due to different units. The crop production variables are in tons.

Value added per worker is used as a metric to represent Poland's efficiency agriculturally, especially against Soviet Block countries, which were weighed down by a public agricultural sector. In order to account for differences in technology and initial inefficiencies after the fall of communism, we use GDP and GDP per capita to explain some of the lower numbers for value added per worker.

Rye and Potato production were included in the model to see if a crop that is a strength for Poland, is a signal of a strength in other countries.

In table 1 we show a summary statistics table of our variables.

Table 1. Summary of Variables

Variable	Min	Max	Mean	Standard Deviation
Agricultural value added per worker, Constant 2005 US Dollars	594.64	153314.26	20031.07	20490.76
Agricultural Value Added, Constant 2005 US Dollars	12448390.79	5342483529	729192383	1110382309
GDP, Constant 2005 US Dollars	773907642.4	3.75188E+12	3.0356E+11	6.12912E+11
GDP Per Capita, Constant 2005 US Dollars	356.51	193648.13	23169.73	26383.31
Potato Production	6000	36312784	2671498.96	4681914.19
Rye Production	1	6287642	337678.42	943791.34

Source: Rye and Potato Data from the Food and Agriculture Organization database Retrieved November 19, 2015, from http://faostat3.fao.org/download/Q/QC/E
Agriculture and GDP from the World Bank database.
Retrieved November 19, 2015, from http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&Type=TABLE#

We are limited in the number of years we could find data from due to a lack of figures prior to the fall of communism in most Soviet Block countries. The year

range selected however gives us a solid look at conditions after the fall of communism, leading up to the joining of the European Union, and multiple years after joining the European Union.

Along with each of the 40 countries in Europe, we also analyzed groups of countries. These groups are: all of Europe, Western Europe, Soviet Block, European Union, and Soviet Block countries in the European Union. These aggregates capture the differences in these groups of nations and help with comparing the overall impacts of having those characteristics. Table 2 holds information on each category and the nations within them.

Table 2. Country Groupings

European Union	Soviet Block European Union	Western Europe	Soviet Block
Austria	Bulgaria	Andorra	Albania
Belgium	Croatia	Austria	Armenia
Bulgaria	Czech Republic	Belgium	Azerbaijan
Croatia	Estonia	Cyprus	Belarus
Cyprus	Hungary	Denmark	Bosnia and Herzegovina
Czech Republic	Latvia	Finland	Bulgaria
Denmark	Lithuania	France	Croatia
Estonia	Poland	Germany	Czech Republic
Finland	Romania	Greece	Estonia
France	Slovak Republic	Iceland	Georgia
Germany	Slovenia	Ireland	Hungary
Greece		Italy	Kosovo
Hungary		Liechtenstein	Latvia
Ireland		Luxemburg	Lithuania
Italy		Malta	Macedonia
Latvia		Monaco	Moldova
Lithuania		Netherlands	Montenegro
Luxemburg		Norway	Poland
Malta		Portugal	Romania
Netherlands		San Marino	Serbia
Poland		Spain	Slovak Republic
Portugal		Sweden	Slovenia
Romania		Switzerland	Ukraine
Slovak Republic		Turkey	

Slovenia Spain Sweden United Kingdom	United Kingdom

Some limitations of this data can be mainly found in the Soviet Block countries. Many were not even recognized as a nation until 2006 and do not have data until a few years thereafter. This puts a heavier weight on earlier years in countries that actually have data since they were established (such as Poland). Additionally, some variables have more consistent data than others. For example, GDP has data for every year that the nation was recognized as a country, but agriculture value added gaps in data for most of the Eastern block countries. This should not take away from the conclusions drawn from our results, but should be taken into account when analyzing the groupings of countries.

Empirical Methodology and Hypothesis:

Using a fixed effects model, we analyze the impacts of value added per worker for each country in Europe and several aggregated subsections from 1990 to 2013. Poland and 1990 serve as the base dummy variables of the model. We hypothesize that when holding constant for all variables, Poland will have on average a superior value added per worker than most countries in the Europe. This signals that post-communism, Poland's efficiency in agriculture was high and lent itself to other industries, which in turn helped Poland succeed economically. Below is our regression equation:

$$Value\ Added\ Per\ Worker$$

$$= \beta_0 + \delta_1 Country + \gamma_1 Year + \beta_1 Agricultural\ Value\ Added$$

$$+ \beta_2 Employment\ in\ Agriculture + \beta_3 GDP + \beta_4 GDP\ \ Growth$$

$$+ \ \beta_5 GDP\ Per\ Capita \ + \ \beta_6 Potato\ Production + \beta_6 Rye\ Production + u$$

Econometric Results:

Table 3. Worker Value Added Model, Poland and 1990 base variables, Regression Results

Variable	Coefficient	S. E.	t-Statistic	p-Value
Dependent Variable: Value Added Per Worker, Constant 2005 US Dollars				
Constant	45,110	8.92E+03	5.06	5.18E-07
Albania	-44,960	8.48E+03	-5.31	1.43E-07
Armenia	-39,760	8.59E+03	-4.63	4.22E-06
Austria	-37,920	8.27E+03	-4.59	5.17E-06
Azerbaijan	-44,630	8.58E+03	-5.20	2.48E-07
Belarus	-14,700	7.66E+03	-1.92	5.52E-02
Belgium	-9,843	9.14E+03	-1.08	2.82E-01
Bosnia and Herzegovina	-28,650	2.32E+04	-1.23	2.18E-01
Bulgaria	-39,050	8.45E+03	-4.62	4.42E-06
Croatia	-34,450	8.76E+03	-3.93	9.06E-05
Cyprus	-33,470	8.58E+03	-3.90	1.04E-04
Czech Republic	-44,220	8.49E+03	-5.21	2.35E-07
Denmark	-23,900	8.23E+03	-2.91	3.76E-03
Estonia	-37,250	8.75E+03	-4.26	2.30E-05
Finland	-24,970	8.39E+03	-2.98	2.98E-03
France	-143,900	9.65E+03	-14.92	< 2e-16
Georgia	-43,190	8.73E+03	-4.95	8.97E-07
Germany	-77,820	8.35E+03	-9.32	< 2e-16
Greece	-66,630	8.70E+03	-7.66	4.97E-14
Hungary	-45,700	8.68E+03	-5.27	1.75E-07
Ireland	-43,160	8.76E+03	-4.93	1.00E-06
Italy	-164,100	9.40E+03	-17.46	< 2e-16
Latvia	-38,260	8.70E+03	-4.40	1.23E-05
Lithuania	-37,610	1.01E+04	-3.71	2.19E-04
Luxembourg	-7,818	9.56E+03	-0.82	4.14E-01
Macedonia, FYR	-37,860	8.59E+03	-4.41	1.17E-05
Moldova	-42,060	8.59E+03	-4.90	1.17E-06
Montenegro	-40,090	1.06E+04	-3.80	1.56E-04
Netherlands	-37,420	8.53E+03	-4.39	1.29E-05
Norway	-23,960	8.45E+03	-2.84	4.67E-03
Portugal	-54,190	8.71E+03	-6.22	7.56E-10
Romania	-60,650	8.51E+03	-7.13	2.15E-12
Serbia	-48,620	1.05E+04	-4.62	4.51E-06
Slovak Republic	-40,760	8.71E+03	-4.68	3.35E-06

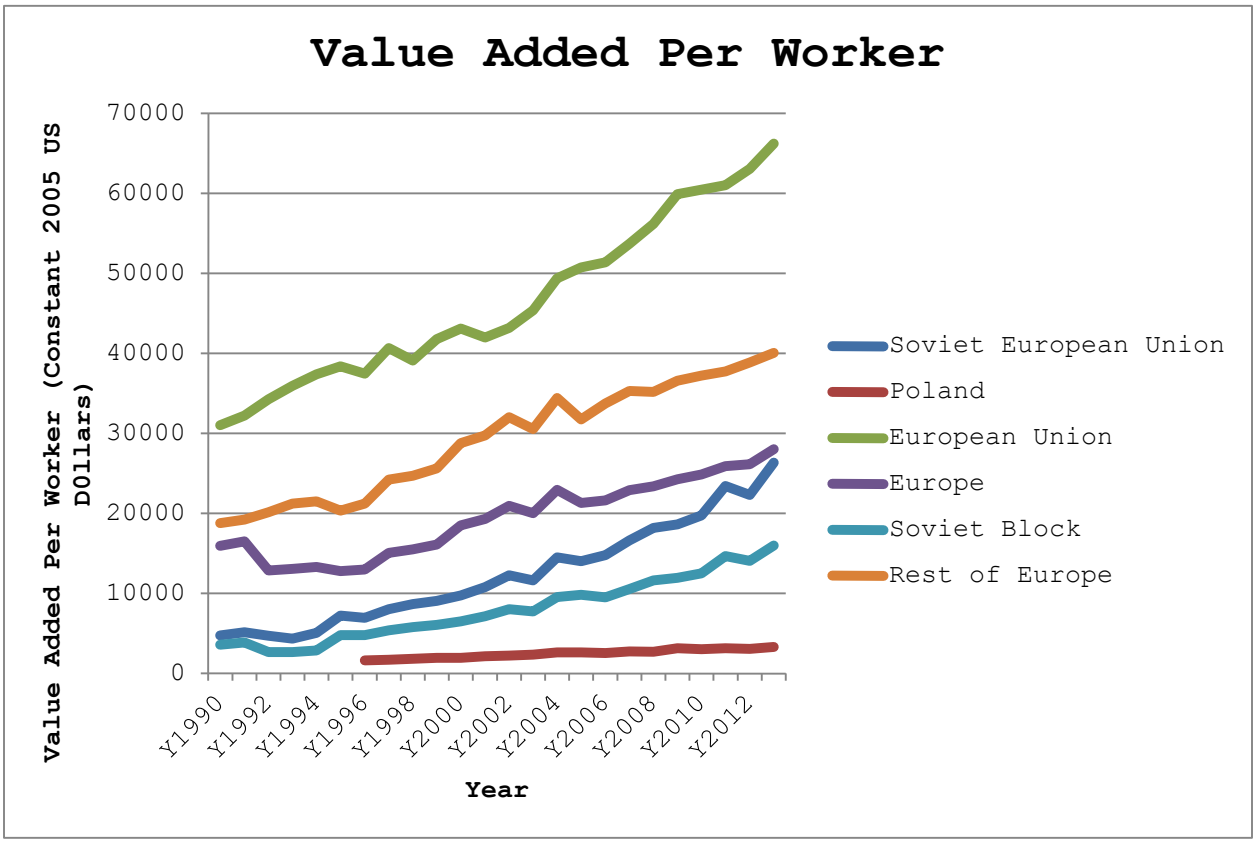
Slovenia	26,810	8.77E+03	3.06	2.31E-03
Spain	-142,800	9.13E+03	-15.64	< 2e-16
Sweden	-33,430	8.29E+03	-4.03	6.01E-05
Switzerland	-42,620	8.40E+03	-5.08	4.72E-07
Turkey	-179,700	9.29E+03	-19.34	< 2e-16
Ukraine	-25,970	8.82E+03	-2.94	3.34E-03
United Kingdom	-86,410	9.14E+03	-9.45	< 2e-16
European Union	-195,000	2.58E+04	-7.55	1.11E-13
Soviet European Union	77,040	7.68E+03	10.04	< 2e-16
Europe	-266,900	3.30E+04	-8.10	1.92E-15
Soviet Block	110,500	1.17E+04	9.43	< 2e-16
Western Europe	-419,300	2.25E+04	-18.61	< 2e-16
1991	-19,660	7.06E+03	-2.79	5.45E-03
1992	-12,130	6.62E+03	-1.83	6.72E-02
1993	2,365	6.64E+03	0.36	7.22E-01
1994	-2,201	6.53E+03	-0.34	7.36E-01
1995	-8,571	6.32E+03	-1.36	1.75E-01
1996	-10,210	6.35E+03	-1.61	1.08E-01
1997	-6,555	6.33E+03	-1.04	3.01E-01
1998	-6,376	6.34E+03	-1.01	3.15E-01
1999	-9,793	6.35E+03	-1.54	1.23E-01
2000	1,630	6.36E+03	0.26	7.98E-01
2001	6,479	6.30E+03	1.03	0.304376
2002	4,828	6.32E+03	0.76	0.445054
2003	-6,251	6.32E+03	-0.99	0.322665
2004	-1,515	6.34E+03	-0.24	0.811053
2005	-5,482	6.29E+03	-0.87	0.383797
2006	-7,912	6.26E+03	-1.26	0.206745
2007	-5,256	6.25E+03	-0.84	0.400758
2008	-8,051	6.26E+03	-1.29	0.198801
2009	-43	6.29E+03	-0.01	0.994603
2010	106	6.29E+03	0.02	0.986551
2011	-1,762	6.30E+03	-0.28	0.779741
2012	6,063	6.26E+03	0.97	0.332764
2013	10,990	6.30E+03	1.75	0.081105
Agricultural Value Added, Constant 2005 US Dollars	0.00000348	1.07E-07	32.55	< 2e-16
GDP, Constant 2005 US Dollars	0.00000002	2.21E-09	7.69	4.04E-14
GDP Per Capita, Constant 2005 US Dollars	0.09518000	3.35E-02	2.84	4.61E-03
Potato Production	-0.00156400	2.89E-04	-5.41	8.03E-08
Rye Production	-0.01344000	1.61E-03	-8.37	2.33E-16
Observations	1272			
R-squared	0.9859			
Adjusted R-squared	0.9847			
F-statistic	825			
p-Value of F-statistic	< 2.2e-16			

Source: Rye and Potato Data from the Food and Agriculture Organization database
Retrieved November 19, 2015, from http://faostat3.fao.org/download/Q/QC/E
Agriculture and GDP from the World Bank database.
Retrieved November 19, 2015, from

http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&Type=TABLE#

Based on our econometric results, we can assert that Poland's value added per worker is superior holding all other variables constant. Every country except Slovenia had a negative coefficient compared to Poland. This is surprising considering Poland's value added per worker is significantly lower than the averages for each country grouping (see graph 3).

Graph 3.

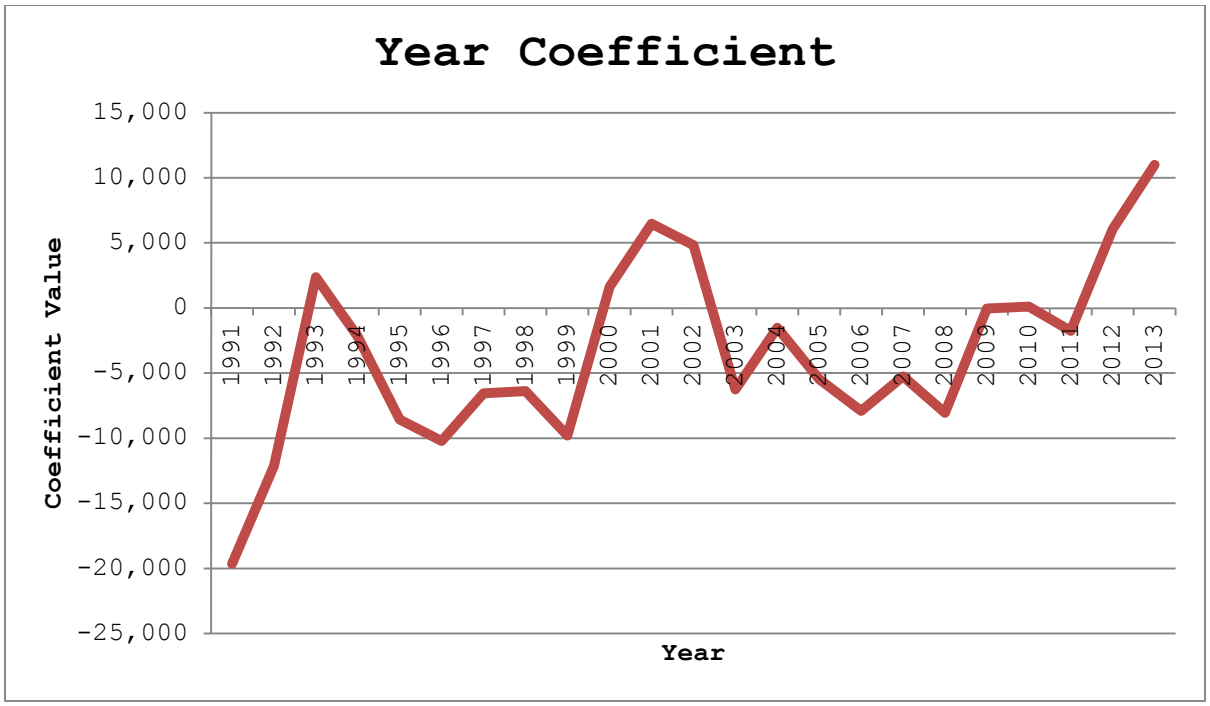


Despite this, only the Soviet Block and European Union Soviet Block had a positive coefficient compared to Poland as a base dummy variable. This leads to the conclusion that while Poland has a higher value added per worker when holding the other variables constant compared to Western Europe, most of the

Soviet Block outperformed them. This points to more of efficiency from other Former Soviet countries compared to Poland for workers adding value. This goes against our initial hypothesis that Poland's private agricultural system allowed Poland to be more efficient and in turn that efficiency spread throughout different fields once Poland transitioned to a market based economy; however, this does not detract from Poland's success compared to the general European Union. This leads to the conclusion that Poland's agricultural strength was a factor in its avoidance of the 2008 recession (Piatkowski 2015).

While few year coefficients were statistically significant, it is interesting to note their trend over time. While no real conclusions can be drawn due to their high p-values, it is interesting to note that compared to 1990 over half of the years have a lower value added per worker. It is interesting to note that years where the European economy was especially strong, 1994-1999 and 2003-2008 (CITE A SOURCE), saw a negative value added per worker compared to the initial year of 1990, but downturns in the economy, especially after the 2008 recession, saw increases in value added per worker.

Graph 4.



Unsurprisingly, agricultural value added, GDP, and GDP per capita all had positive coefficients on the Value Added Model. As all of these variables increase, value added per worker increases as well. However, Rye and Potato production saw the opposite effect on value added per worker. Thus the more rye and potatoes produced by a country, the lower their value added per worker would be. One might note this is a correlation rather than a direct causation, yet it shows that something that was and still continues to be a strength of Poland is an indicator of lower value added per worker in other countries.

Conclusion:

This paper provides empirical evidence that Poland's value added per worker is superior to all countries in Europe except Slovenia when holding

constant other variables such as agriculture value added, GDP, GDP per capita, rye production, and potato production. This lends to the conclusion that Poland's private agricultural system helped contribute to its transition out of communism, into the European Union, and ultimately helped it stave off economic shrinkage during the recession. While this is a factor to Poland's unique and impressive success story, it is only a small piece to the puzzle. Poland is an exceptional example of what triumph can emerge from the ruins of a failed country and economic system. As Poland continues to thrive, it can thank its strong private agricultural roots and further industrialize moving forward.

Variables that could be explored in future research are agricultural value added (as a percentage of GDP) and employment in agriculture (as a percentage in total employment). Figures for these factors can be found on the World Bank database, however some of the figures are clearly not in percentages and thus corrupted. Additionally, the model could be expanded to include data from years prior if a break down of countries that eventually split could be obtained. A spotlight could also be done on other industries from Poland that is exceptionally strong, such as chemical manufacturing (CITE).

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