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MANUFACTURING TRENDS IN THE GERMAN AUTOMOTIVE INDUSTRY

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Abstract

This paper looks at manufacturing and sales trends of German passenger vehicles from automakers Volkswagen AG (and therein Audi), Daimler AG, BMW, and Porsche in order to see if their current manufacturing strategies, which are heavily focused within Germany, will remain economically justified and sustainable in the long run. In the context of this paper I look at “economically justified” from a total supply chain cost perspective, i.e. production in a country with higher labor costs may still be “economically justified” if it has a close proximity to the target market, since in this case lower transportation costs may offset higher labor costs.

This topic is important because automobile manufacturing within Germany is one of the largest sources of employment, GDP, and tax revenue for the country. Given that automobile manufacturing around the globe has struggled following the financial crisis of 2008, it becomes even more critical that the potential strengths and weaknesses of the aforementioned companies be examined. In this examination of the German automotive industry however, the fact that manufacturing in Germany is more expensive in terms of labor costs and is further away from growing markets than other labor market alternatives makes any marginal manufacturing of vehicles within Germany economically unjustified without the intervention of government.

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Introduction

With the appearance of the financial crisis in late 2008, the business world in general became witness to forceful change, with once seemingly invincible companies collapsing. Arguably one of the most iconic of these collapses came in the form of the U.S. automotive industry, which required large amounts of government bailout money just to stay solvent. Of course America is not the only place where the automotive industry is seeing some issues. Toyota, a Japanese company, is forecasting its first operating loss in 71 years for their 2010 fiscal year, and other Japanese powerhouses such as Honda and Suzuki are slashing production in order to match weakened global demand.¹

Perhaps even more striking though are the recent changes to the automotive industry within Germany. Long considered a cornerstone for innovation, Germany also prides itself as being the birthplace of the auto, with Karl Benz and Gottlieb Daimler having developed separate automobiles in 1885. More important though than the image of the industry within the country are the numbers surrounding it. Estimates by the European Automobile Manufacturers' Association show that one in every 7 jobs within the country is in some shape or form dependent upon the automotive industry. Furthermore, revenues within the industry account for roughly 10% of the country's GDP.²

It goes without saying then that the economic success of Germany is dependent upon the economic success of its automotive industry. If the industry were to be compromised, then so would the country's economic power.

This paper therefore aims to examine the underlying strengths and/or weaknesses of the German automotive industry from a manufacturing and sales perspective. The strength of demand for German automobiles within Germany and the cost of producing these vehicles domestically is first examined to assess the health of the industry within Germany alone. From

there, global demand and international labor markets are examined not only to measure the German automotive industry's potential for expansion outside of Germany, but also to provide a relative measure for the aforementioned analysis of domestic production and sales. Ultimately, in doing so this paper will identify some of the best markets for German automakers to both sell and produce in going forward.

Research Methodology

The data used for this research is all secondary data collected from various esteemed agencies associated with regional statistics for Europe (ex: The EU Commission), automotive labor unions within Germany (ex: Verband der Auto Industrie, or VBA for short), and from the annual reports of the auto manufacturers. Secondary data analysis is appropriate for this type of study because the variety and quality of databases relative to the German auto industry provide in depth statistics, which would not be outdone by primary research and which taken altogether can allow for an accurate insight into the industry.

Data for this study were collected mainly from May 2010 through October 2010. Being that the goal of this thesis is to assess the future viability of manufacturing in Germany, the most recent annual statistics in any case are always used. Further historical data may be used when identifying growth trends within the industry, but in any case no data is ever considered which predates the reunification of Germany in 1990, as such data cannot provide an accurate picture of trends.

Furthering the credibility of the data collected, it is important to note that although each database aims to show different aspects of Europe or of the automotive industry, there is often correlation between numbers across databases. Looking at three data sources:

- VDA – Verband der Autoindustrie (German Automotive Labor Union)
- IRF – International Road Federation
- ACEA – European Automobile Manufacturers' Association

this congruency among statistics becomes visible, as evidenced in the small sample show in Exhibit 1 (See Appendix I for the original sources).

Source	German PKW Registration
VDA	3,090,040
IRF	3,090,040
ACEA	3,090,040

Exhibit 1 – Correlation of Numbers Amongst Varying Data Sources

Notice that in all three different databases, the figure for the number of registrations of passenger cars (*PKW*) in Germany in 2008 is the same in all three databases, albeit formatted differently. In this specific case every year in each database can be cross checked with the others, but for brevity's sake this is not shown. Regardless, having this overlap between the statistics not only bolsters the credibility of the numbers provided but also shows that much of the secondary data collected for this study has been conducted using mostly universally accepted statistics for the industry.

Analysis

I. German Domestic Demand Analysis

Being one of the best global economies, the German market for its own automobiles has historically been strong. Following the reunification of East and West Germany in 1990, Germany witnessed a surge in domestic demand which at the time allowed the companies to prosper in spite of weak exports.³ Many East Germans had been put on waiting lists for years to receive their vehicles in the GDR (German Democratic Republic, i.e. East Germany), and once Germany was reunified the auto makers of Western Germany had a larger and revived market in which to sell its products. Once this initial surge had been fulfilled, however, demand for automobiles in Germany returned to relatively constant levels, as seen below in Exhibit 2.



Exhibit 2 - Car registrations in Germany have stagnated after the “Fall of the Wall” Source: ACEA⁴

In absolute numbers, passenger car registrations within Germany peaked at 4,158,674 in 1991, a 36.8% increase over the prior year. In 1993 the total number of registrations dipped down to 3,194,204 and since then registrations have peaked at a number of 3,802,176 in 1999.⁴

In more recent years the outlook has been even worse. In 2006 registration of passenger vehicles totaled 3,467,961, falling to 3,090,040 in 2008 – an almost 11% drop which also signals

the lowest total of new car registrations in Germany over a full year period since before the reunification.

From a general economic perspective, Germany remains in the middle when it comes to growth in Europe. From 2000-2007, Germany's GDP based on Purchasing Power Parity per capita had a Compound Annual Growth Rate of about 1.36% adjusted for inflation, placing its growth below countries like Finland, Greece, Ireland, and Luxembourg (3%, 3.15%, 2.66%, and 2.35%, respectively) but above countries like Belgium, Italy, the Netherlands, and Spain (1.24%, .7%, .73%, and .99%, respectively).⁵ Projected out to 2010, this growth rate for Germany is expected to increase to 1.49%.⁵ When scaled and compared to the average PPP per capita across all EU-27 countries, Germany has seen its relative strength fall slightly from 118.5% of the average in 2000 to 115% in 2007 – a trend which was experienced by virtually all of the larger economies within the EU.⁶

In terms of market size, however, Germany stands out within the European Union. With a population that exceeds 80 million, the next closest country is France with a population of a little over 60 million people.⁷ Germany's motorization levels are also very high, with 501 passenger cars attributed to every 1,000 residents in 2007.⁷ In absolute terms, this rate in 2007 converted to roughly 41,184,000 passenger cars owned throughout the entire country. For comparison purposes, the total number of ownership in the EU-27 in 2007 amounted to 229,764,000, meaning Germany alone was responsible for about 18% of all vehicles owned within the European Union⁷ (p. 44).

When matching domestic demand against domestic production over the past decade, Germany has seen a fairly steadily increasing amount of production, yet falling demand. The following graph shows this more clearly:

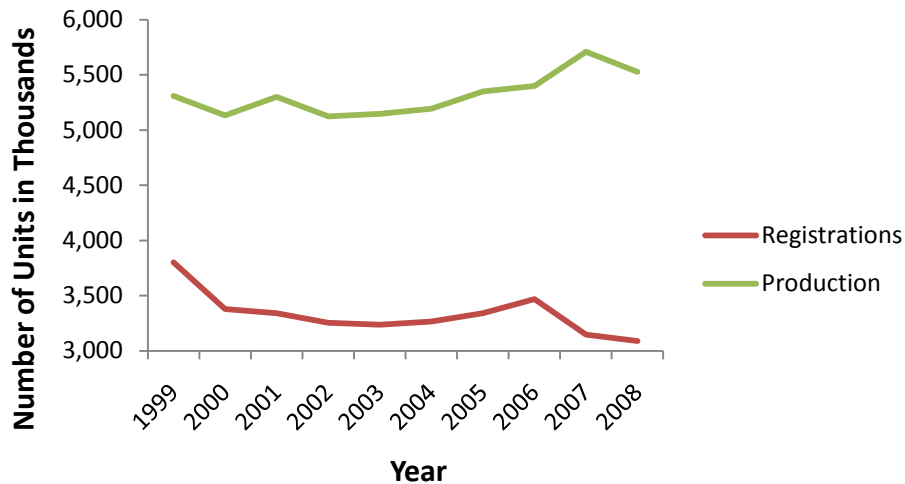


Exhibit 3 – Registrations of vehicles vs. Production in Germany; Sources: OICA⁸, VDA⁹

Note that for Exhibit 3, “registrations” include all types of passenger car brands (not just German brands), and “production” refers to the number of units produced within the country’s borders, again regardless of brand.

So what exactly accounts for this ever increasing gap between domestic demand and domestic production of passenger vehicles? Everything which falls in between would either be: 1.) unsold or 2.) exported out of the country. However, when looking at Exhibit 4 below, which shows the exports out of Germany over the same time frame, it becomes clear which of these two factors is the main cause of the widening gap between production and consumption:

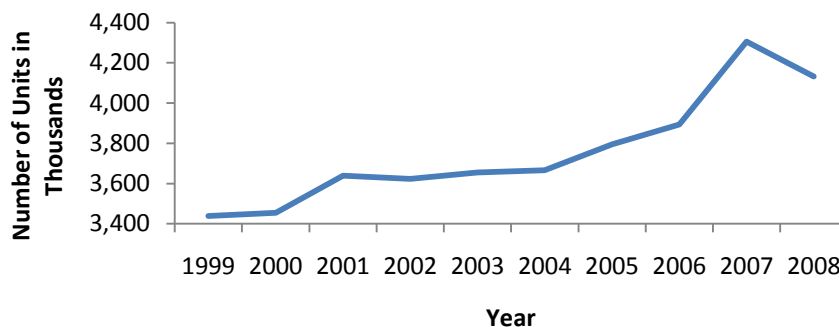


Exhibit 4 – Exports out of Germany in Thousands, Years 1999-2008 (Source: VDA⁹)

This rise in exports helps to highlight one of the key issues in determining the fate of future production within Germany, namely that Germany is far from being an “expansive economy” for automobile manufacturers. Following the reunification of Germany in the early 1990s demand has leveled off and remained, at best, constant. Given the already high levels of motorization within the country and the competitive automotive market, it would be almost impossible for companies to expand much of their sales within Germany. Instead of providing opportunities for growth and new sales, the country provides already established manufacturers within the region a rather large and steady stream of income. In terms of investing in more production capacity though, the country already has most if not all of its demand for passenger vehicles well covered with its current production levels.

II. Production Costs within Germany

Considering that Germany is one of the world’s strongest economies, and given that labor unions in Germany usually wield more power than unions seen in either developing countries or countries like the U.S., the cost of employing people within Germany is relatively high. Exhibit 5 shows a breakdown of the average yearly cost of auto manufacturing employees within given regions in Germany:

geo/time	2004A00	2000A00	CAGR since 00	2008 EST	2009 EST
DE1 Baden-Württemberg	€ 68,672.86	€ 61,545.63	2.78%	€ 76,625.45	€ 78,753.53
DE2 Bayern	€ 60,712.37	€ 55,257.87	2.38%	€ 66,705.28	€ 68,293.76
DE3 Berlin	€ 63,012.48	€ 53,567.38	4.14%	€ 74,122.96	€ 77,194.13
DE4 Brandenburg	€ 46,124.21	€ 40,148.98	3.53%	€ 52,988.71	€ 54,858.88
DE5 Bremen				€ 0.00	€ 0.00
DE6 Hamburg				€ 0.00	€ 0.00
DE7 Hessen	€ 63,348.95	€ 56,711.54	2.81%	€ 70,763.19	€ 72,748.56
DE8 Mecklenburg-Vorpommern	€ 31,134.13	€ 29,709.06	1.18%	€ 32,627.56	€ 33,011.98
DE9 Niedersachsen	€ 63,923.73	€ 61,428.82	1.00%	€ 66,519.97	€ 67,185.34
DEA Nordrhein-Westfalen	€ 58,006.33	€ 51,321.40	3.11%	€ 65,562.01	€ 67,599.97
DEB Rheinland-Pfalz	€ 54,341.37	€ 49,447.61	2.39%	€ 59,719.46	€ 61,145.17
DEC Saarland	€ 55,352.72			€ 55,352.72	€ 55,352.72
DED Sachsen	€ 40,746.20	€ 34,831.65	4.00%	€ 47,665.06	€ 49,571.09
DEE Sachsen-Anhalt	€ 33,295.37	€ 26,070.63	6.31%	€ 42,522.24	€ 45,203.73
DEF Schleswig-Holstein	€ 52,553.82	€ 42,152.35	5.67%	€ 65,521.95	€ 69,236.07
DEG Thüringen	€ 35,513.29	€ 31,397.99	3.13%	€ 40,167.98	€ 41,424.02

Exhibit 5 – German Auto Manufacturing Per Capita Labor Costs, by Region; Source: Eurostat¹⁰

Using this regional data, the cost of labor on a manufacturer level can be more closely examined:

Volkswagen Plants in Germany

City	State	# of	2004 Labour	Est. 2009	Plant opened in:	Produces:
		Employees *	Cost Per Employee	Labour Cost Per Employee		
Ingolstadt	Bayern	46,502	€ 60,712.37	€ 68,293.76	1964	A3, A3 Sportback, A4, A4 Avant, A5 Coupe, Q5
Neckarsulm	Baden-Wuerttemberg	46,502	€ 68,672.86	€ 78,753.53		A4, A5 Cabriolet, A6, A6 Avant, A6 Allroad, A8, R8
Kassel	Hessen	13,600	€ 63,348.95	€ 72,748.56	1958	gearboxes, foundry
Zwickau	Sachsen	7,632	€ 40,746.20	€ 49,571.09	1990	Golf, Passat
Chemnitz	Sachsen	7,632	€ 40,746.20	€ 49,571.09		Engines
Dresden	Sachsen	393	€ 40,746.20	€ 49,571.09	2001	Phaeton
Salzgitter	Niedersachsen	6,200	€ 63,923.73	€ 67,185.34	1970	engines
Braunschweig	Niedersachsen	5,700	€ 63,923.73	€ 67,185.34		chassis
Hanover	Niedersachsen	12,900	€ 63,923.73	€ 67,185.34		VW T5, foundry
Wolfsburg	Niedersachsen	44,200	€ 63,923.73	€ 67,185.34	1938	Golf, Golf Plus, Tiguan

Exhibit 6 – VW Plants in Germany and Associated Labor Cost for Region; Source: Volkswagen AG¹¹

Daimler Plants in Germany

City	State	# of	2004 Labour	Est. 2009	Plant opened in:**	Produces:
		Employees	Cost Per Employee	Labour Cost Per Employee		
Berlin	Berlin	2,991	€ 63,012.48	€ 77,194.13	1902	Replacement engines production, engines, components and parts
Bremen	Bremen	12,993	n/a		1962	Mercedes-Benz C-Class, E-Class, SLK, SL, GLK
Hamburg	Hamburg	2,595	n/a		1971	Axles, components
Rastatt	Baden-Wuerttemberg	5,741	€ 68,672.86	€ 78,753.53	1992	Mercedes-Benz A-Class, B-Class
Sindelfinge	Baden-Wuerttemberg	28,804	€ 68,672.86	€ 78,753.53	1915	Mercedes-Benz S-Class, E-Class, C-Class, CL-Class and CLS-Class and Maybach
Stuttgart	Baden-Wuerttemberg	18,146	€ 68,672.86	€ 78,753.53	1904	Engines, axles, transmissions, components incl. "upstream" facilities foundry and forge

Exhibit 7 – Daimler Plants in Germany and Associated Labor Costs Per Region; Source: Daimler AG¹²

**Opened in dates correspond to when plant officially became owned by Daimler AG

BMW Plants in Germany

City	State	# of Employees	2004 Labour Cost Per Employee	Est. 2009		Plant opened in:	Produces:			
				Labour Cost Per Employee	Labour Cost Per Employee					
Leipzig	Sachsen	4,700	€ 40,746.20	€ 49,571.09	€ 49,571.09	2005	3 series, 1 series, BMW X1			
Eisenach	Thuringen	250	€ 35,513.29	€ 41,424.02	€ 41,424.02	1992	Large Metal Body Parts			
Wackersdorf	Bayern	2,700	€ 60,712.37	€ 68,293.76	€ 68,293.76	1990	Cockpits			
Regensburg	Bayern	9,500	€ 60,712.37	€ 68,293.76	€ 68,293.76	1986	1 Series, 3 Series, M3, Z4			
Dingolfing	Bayern	19,400	€ 60,712.37	€ 68,293.76	€ 68,293.76	1973	5 Series, 6 Series, 7 Series, M5, M6, Rolls-Royce Phantom			
Landshut	Bayern	3,100	€ 60,712.37	€ 68,293.76	€ 68,293.76	1967	Components, shafts			
Munich	Bayern	9,000	€ 60,712.37	€ 68,293.76	€ 68,293.76	1922	3 Series; engines			

Exhibit 8 – BMW Plants in Germany and Associated Labor Costs Per Region;
Sources: BMW Leipzig¹³, BMW Group¹⁴, BMW Wackersdorf¹⁵, BMW Regensburg¹⁶, BMW Dingolfing¹⁷, BMW Landshut¹⁸, BMW Munich¹⁹

In Exhibit 6, Exhibit 7, and Exhibit 8 the 2009 Estimated Labor Cost for Employee has been calculated by using the Compound Annual Growth Rate over the time period of 2000-2004 as seen in Exhibit 5, and assuming that that growth rate stays constant until 2009.

Of importance in looking at the above tables is that within Germany alone there is a significant disparity in terms of labor costs. The biggest contributor to this is the fact that the former East German states have lower labor costs across generally all industries, and since the collapse of East Germany manufacturing has slowly begun to shift from the historically richer states of the West (ex: Bayern) and into former East states (ex: Sachsen) where these companies can still enjoy the benefits of domestic production while at the same time taking advantage of much lower labor costs. Volkswagen in particular has followed this type of strategy, as their subsidiary VW Sachsen GmbH has opened their last 3 factories in Germany, with employment throughout these three plants totaling roughly 8,000. Given in Exhibit 5 that the yearly cost of a full time employee in these areas is roughly €20,000 less than many of the other manufacturing areas in Germany, such a strategy can quickly result in significant savings.

BMW has also adopted a strategy similar to Volkswagen's, with 2 of their 3 plants since the collapse of the Soviet Union being constructed in former East German states. Even Porsche, which for the most part has kept the majority of its production at its main factory in Stuttgart, opened a plant in Leipzig, Sachsen, where they now produce the Cayenne. Daimler AG however has not followed this trend; their only plant opened within Germany after 1990 would be the plant in Rastatt, which shares a close proximity to their corporate headquarters in Stuttgart.

Ultimately, in addressing how much of an impact these labor costs within Germany have on operations, it is important to look at how much labor costs contribute to the overall cost of a vehicle, i.e. how much of an impact labor costs can have on profit margin. Below in Exhibit 9 are select items from the Annual Report issued by Volkswagen which illustrate this effect from 2004-2008:

Volkswagen Income Statement						
		2008	2007	2006	2005	2004
Sales Revenue		113,808	108,897	104,875	93,996	88,963
Cost of Goods Sold:		96,612	92,603	91,020	81,733	78,430
	Cost of Materials	75,954	72,340	66,935	62,620	58,239
	Personnel Expenses	15,784	14,549	17,400	14,796	14,038
	Overhead	4,874	5,714	6,685	4,317	6,153
Gross Profit		17,196	16,294	13,855	12,263	10,533
Profit Margin		15.11%	14.96%	13.21%	13.05%	11.84%

Exhibit 9 – Volkswagen 2008 Annual Report Items; Source: Volkswagen 2008 Annual Report p. 141²⁰

Using the averages over this 5 year period, each percent change in the “% personnel expenses of CoGS” category negatively impacts the Profit Margin by .86%. Since the cost of personnel expenses relative to the overall Cost of Goods Sold averages out to 17.39%, each percent increase in the personnel expenses category has a negative impact of .15% on the overall profit margin, meaning that a 6.66% increase in personnel expenses would decrease the profit margin roughly by 1%.

Of course the above items do not filter out production outside of Germany. Since German labor costs are generally considered to be higher than elsewhere, the above numbers may be skewed low due to the fact that they include lower labor cost areas in the personnel expenses category, especially in the case of VW which out of all of the German manufacturers has the largest investment in international production.

Thus, for comparison's sake, it may be more accurate to look at select financial statements for Daimler, seen below in Exhibit 10:

Daimler AG (numbers in million Euros)			
	2008	2007	2006
Revenue	95,873	99,399	99,222
CoGS	74,314	75,404	78,782
Non personnel costs	59,122	55,148	55,208
Personnel costs	15,192	20,256	23,574
Gross Profit	21,559	23,995	20,440
Profit Margin	22.49%	24.14%	20.60%
% of Personnel Expenses to CoGS	20.44%	26.86%	29.92%

Exhibit 10 – Daimler AG 2008 Annual Report Items; Source: Daimler Annual Report²¹ p. 144

In the case of Daimler, whose production facilities are mostly located within Germany or western European countries, the contribution of personnel costs to the profit margin are higher than what is seen with Volkswagen. Using the average over the provided three year period, a 5% increase in the personnel expense category would result in a 1% decrease in the overall profit margin, meaning that for every 1% increase in personnel expenses the profit margin is decreased by .2%. See Appendix II for more details on the calculations of the contribution of personnel expenses to overall profit margin for Volkswagen and Daimler AG.

Ultimately what this shows is that personnel costs are a large cost contributor for German automobile manufacturers. Even small reductions in personnel costs can help contribute to modest increases in the overall profit margin for these companies. Volkswagen, more so than

any of the other German manufacturers, has been minimizing the impact of personnel expenses on its profit margin, which could arguably be attributed to the fact that it has more factories outside of Germany than any of its competitors. For Daimler, BMW, and Porsche, who are all still heavily focused on manufacturing operations in Germany, marginal reductions in personnel expenses can have a much more significant impact on overall profit margins.

III. International Demand Analysis

In terms of absolute unit sales, Germany's share of demand for its own vehicles is far from being overpowering. For Volkswagen, an overview of deliveries throughout major regions is shown in Exhibit 11, taken from p. 121 of their 2008 Annual Report:

DELIVERIES TO CUSTOMERS BY MARKET¹

	DELIVERIES (UNITS)		CHANGE (%)	SHARE OF PASSENGER CAR MARKET (%)	
	2008	2007		2008	2007
Europe/Remaining markets	3,705,119	3,760,943	-1.5		
Western Europe	2,988,980	3,111,601	-3.9	20.3	19.5
of which: Germany	1,060,349	1,055,037	+0.5	33.6	32.7
United Kingdom	380,048	403,158	-5.7	16.3	15.6
Spain	278,322	366,391	-24.0	23.0	21.4
Italy	264,978	280,459	-5.5	11.1	10.4
France	270,341	262,564	+3.0	11.9	12.0
Central and Eastern Europe	561,055	496,785	+12.9	10.6	10.5
of which: Russia	132,918	80,917	+64.3	4.5	3.2
Czech Republic	79,626	86,881	-8.4	51.2	61.4
Poland	77,478	71,876	+7.8	21.4	22.1
Remaining markets	155,084	152,557	+1.7		
of which: Turkey	54,818	69,387	-21.0	11.0	11.8
North America²	503,134	530,630	-5.2	3.1	2.8
of which: USA	314,513	329,234	-4.5	2.4	2.0
Mexico	139,252	156,186	-10.8	13.5	14.0
Canada	49,369	45,210	+9.2	3.0	2.7
South America/South Africa	876,764	845,510	+3.7	19.4	19.2
of which: Brazil	637,480	581,292	+9.7	24.0	24.9
Argentina	127,186	114,929	+10.7	25.4	25.8
South Africa	73,321	101,181	-27.5	20.8	22.1
Asia-Pacific	1,172,368	1,052,505	+11.4	8.0	7.3
of which: China	1,024,183	910,494	+12.5	18.6	17.8
Japan	61,626	67,469	-8.7	1.5	1.5
Worldwide	6,257,385	6,189,588	+1.1	10.3	9.6
Volkswagen Passenger Cars	3,667,624	3,663,154	+0.1		
Audi	1,003,469	964,151	+4.1		
Škoda	674,530	630,032	+7.1		
SEAT	368,104	431,024	-14.6		
Bentley	7,605	10,014	-24.1		
Lamborghini	2,430	2,406	+1.0		
Volkswagen Commercial Vehicles	503,025	488,726	+2.9		
Scania ³	30,527	-	-		
Bugatti	71	81	-12.3		

1 Deliveries and market shares for 2007 have been updated to reflect subsequent statistical trends.

2 Overall markets in the USA, Mexico and Canada include passenger cars and light trucks.

3 July 22, 2008 to December 31, 2008.

Exhibit 11 – Volkswagen Worldwide Deliveries 2007 and 2008; Source: Volkswagen 2008 Annual Report²⁰

For Volkswagen, the historically strong markets of Western Europe and the United States have weakened over the past 2 years. Instead, markets such as Russia (64% growth), Brazil (10% growth) and China (12.5% growth) have been the most successful in terms of deliveries for Volkswagen. With China representing 1.02 million units and Brazil totaling over 600,000 units, these markets also are the 2nd and 3rd largest in terms of absolute numbers, behind only Germany which demanded slightly over 1.06 million units in 2008.

As shown in Exhibit 12, BMW has also begun to take advantage of some of the growth available in emerging markets:

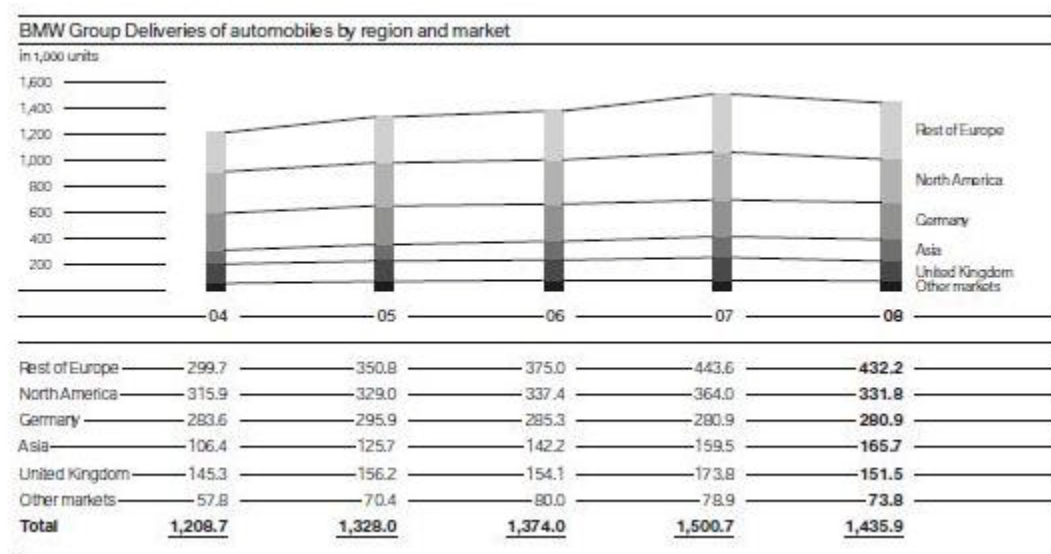


Exhibit 12 – BMW Worldwide Deliveries 2004-2008; Source: BMW Group Annual Report 2008²² p. 20

According to their own financial report, the BMW Group experienced very strong growth rates in Eastern Europe, although this growth was not strong enough to offset negative trends in Western Europe.²² This growth within Eastern Europe is still, however, heavily responsible for the strong growth in the “Rest of Europe” category in Exhibit 12, especially considering that the growth in the other traditionally strong markets for BMW (Germany and North America) was fairly stagnant over the same time frame. Looking at just the past two years, the only market which achieved any positive growth for BMW was the Asian market, with China alone accounting for 75,481 deliveries in 2008, a remarkable 23.3% increase over the previous year in spite of the worldwide recession.

However, unlike Volkswagen, where “emerging markets” are simultaneously some of the biggest markets for the company, BMW is much more heavily embedded into the traditional markets:

BMW Group – key automobile markets 2008
as a percentage of sales volume

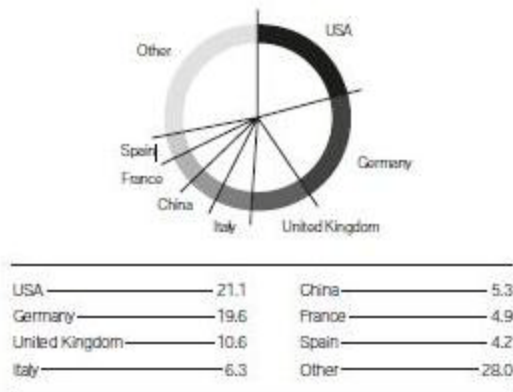


Exhibit 13 – BMW Percent of Total Sales Volume by Market; Source: BMW Group Annual Report 2008²² p. 20

As seen in Exhibit 13, the United States, Germany, and the United Kingdom combine for over 50% of all of BMW's sales worldwide. China, even considering its remarkable growth in the past year, still only represents a relatively small share of BMW's sales at 5%. Other markets where Volkswagen has seen considerable growth in the past few years, namely Russia and Brazil, are relatively very small markets for BMW.

When looking at Exhibit 14, it becomes clear that Daimler AG also has experienced this type of decline in traditionally strong markets mixed with growth in emerging countries.

Unit sales in 2008 ¹		
	1,000 units	08/07 % change
Mercedes-Benz	1,126	-5
thereof A/B-Class	250	-9
C/CLK/SLK-Class	448	+16
E/CLS-Class	173	-25
S/CL/SL-Class/SLR/Maybach	93	-13
M/R/GL/GLK/G-Class	161	-11
smart	139	+35
Mercedes-Benz Cars ²	1,273	-2
thereof Western Europe	733	-6
thereof Germany	332	-3
NAFTA	282	+2
thereof United States	251	-0
Asia/Pacific	159	+14
thereof Japan	37	-20

¹ Group sales (including leased vehicles)

² The figure for 2008 includes 8,200 Mitsubishi vehicles manufactured and/or sold in South Africa.

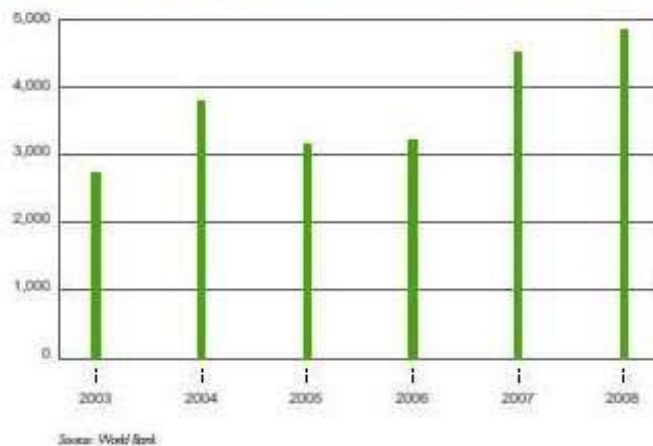
Exhibit 14 – Daimler Sales by Market; Source: Daimler AG Annual Report 2008²¹ p. 93

Developed markets for Daimler AG (and coincidentally many of the luxury and high end vehicles for Daimler) all experienced negative growth throughout the global recession, with the United States alone having seen an 11% drop in passenger car deliveries from 2007 to 2008. Meanwhile, Daimler experienced very strong growth in China (+59%) and in the Middle East (+36%).²¹

Still though, for Daimler, the 159,000 units sold in the Asia Pacific region are relatively small compared to the 332,000 sold in Germany, and especially when compared with the 733,000 units sold throughout Western Europe. The chance does remain that the Asia Pacific region will start to rival the Western European region, as a sustained 14% growth rate per year would allow Asia-Pacific to surpass the 332,000 units sold in Germany within 6 years. However, sustaining such a growth rate over a longer period of time like this remains unlikely, and such an assumption ignores any growth (positive or negative) which could occur in Germany's market.

But what then are some of the reasons why, even in spite of the global economy, a large amount of growth has still been seen in emerging markets? A huge contributor to this would be an ever increasing expenditure on infrastructure:

3.10 World Bank total transport lending (million dollars)



3.11 Transport lending breakdown by region - 2008

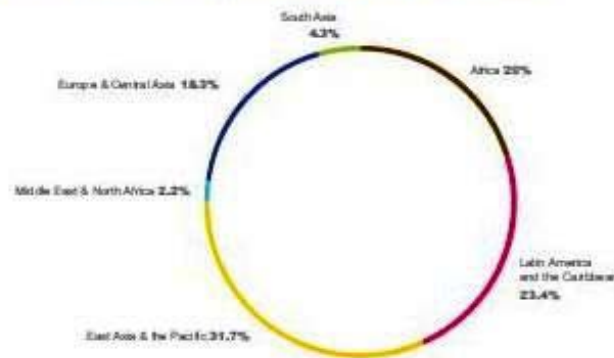
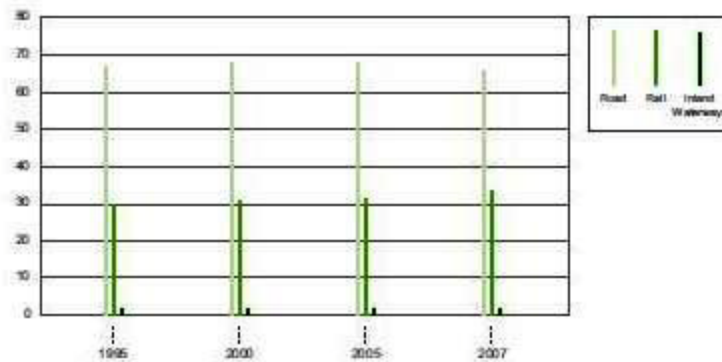


Exhibit 15 – Allocation of Worldwide Transportation Lending; Source: IRF²³ p. 25

As seen in Exhibit 15, roughly \$5 trillion in 2008 alone was given to fund transportation projects, with roughly one third of that going to the Asia Pacific region, one fourth going to Latin America, and 18% going to Europe. As shown before (especially in the case of Volkswagen) the Asia Pacific Region and the Latin America region are arguably the two strongest growth markets for automakers right now, and given the amount of money these regions are investing in new roadways it is hard to see why this demand would not be there.

In the case of Europe, which again receives 18% of the roughly \$5 trillion transportation dollars (hardly a small figure) there of course remains the difference between the traditional markets and the emerging markets which needs to be further examined.

4.6 Transport infrastructure investment split in Western European countries*



Source: IFF

* Austria, Denmark, Finland, France, Germany, Iceland, Ireland, Norway, Portugal, Spain, Sweden, United Kingdom

4.7 Transport infrastructure investment split in Central and Eastern European countries*

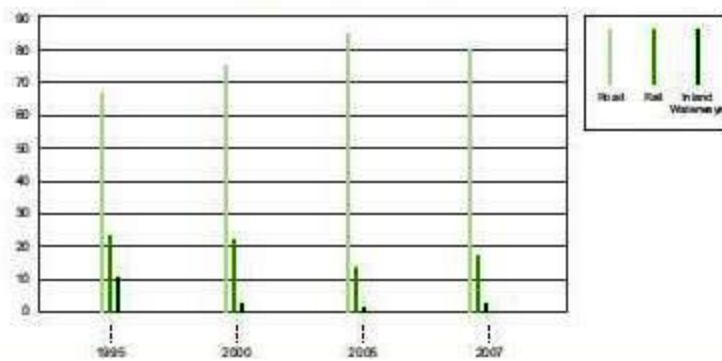


Exhibit 16 – Comparison of investment split in Western and Eastern European countries; Source: IRF²³ p. 30

As shown in Exhibit 16, since 1995 infrastructure investment in Eastern European countries has been more heavily focused on roads and motorways than in Western Europe, where more investment is placed into trains and alternative methods of transportation. This of course makes sense when looking at the road networks already in place throughout Europe (See Exhibit 17).

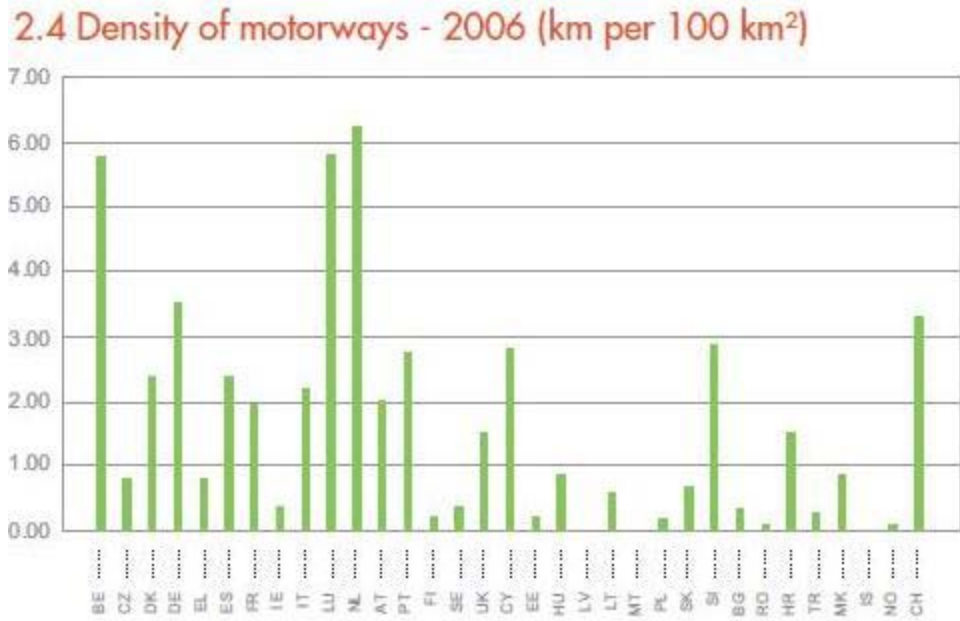


Exhibit 17 – Motorway Density of EU Member Countries; Source: IRF²³ p. 18

Belgium (BE), Luxembourg (LU), and Switzerland (CH), arguably three of the richest countries in Western Europe, all have motorway densities which far exceed some of the poorer Eastern European countries, such as the Czech Republic (CZ), Poland (PL) and Romania (RO). Looking at the passenger registrations alone, in 2006 the three richer countries totaled 846,430, leaving a rather large 28% gap between it and the three aforementioned Eastern European countries, whose registrations in that year totaled 610,188. In just two years however that gap had been cut in half, with the three richer countries totaling 875,795 registrations and the three poorer ones totaling 749,115.²³ A possible reason for this accelerated growth in the poorer regions is shown in the graph above: a comparatively less dense motorway means that investment in a country's infrastructure may influence motorization levels more so than in countries where motorways are already denser, i.e. the more rapid change in roadway density in poorer regions calls for a more rapid increase in vehicle demand, as compared to richer countries where roadway density is not increasing nearly as much.

In sum, international markets provide the automakers something which the German market cannot – fast growth. As is the case for all automakers, specifically in the Asia Pacific and Latin American regions, there has been an intensely growing demand over the past few years for more automobiles as the countries and their infrastructures have developed. This too has been the case in Eastern Europe, which surprisingly became the growth driver in Europe for many companies over the past year as the global recession severely impacted Western Europe. Although many of these foreign ventures still pale in comparison to operations in Germany, they are growing at a rate which will lessen the gap in the not too distant future. Given that vehicle demand in Germany is unlikely to experience any significant growth, investments in increasing production capacity will be done with foreign markets in mind, as these markets will provide opportunities for further expansion and increased sales.

IV. Alternative Labor Markets

Among the major German automakers, the practice of off-shoring labor has for the most part been avoided. With the exception of Volkswagen, production of vehicles has been relatively restricted to Germany and other high income countries. Exhibit 18, Exhibit 19, Exhibit 20, and Exhibit 21, all constructed from data provided by the International Organization of Motor Vehicle Manufacturers, highlight these companies' manufacturing strategies within the Euro zone.

Manufacturer BMW

Row Labels	Values		
	2006 Production	2007 Production	2008 Production
BMW	1,019,363	1,095,076	984,761
Austria	114,306	111,665	82,863
Germany	905,057	983,411	901,898
Mini	187,454	237,700	235,019
UK	187,454	237,700	235,019
Rolls Royce	67	1,029	1,417
UK	67	1,029	1,417
Grand Total	1,206,884	1,333,805	1,221,197

Exhibit 18 – BMW Production by Year and Country; Source: OICA⁸

Manufacturer Daimler

Row Labels	Values		
	2006 Production	2007 Production	2008 Production
SMART	67,689	102,660	139,964
France	67,689	102,660	139,964
Daimler	984,429	1,021,512	1,003,250
Austria	4,335	4,442	5,481
Germany	943,793	980,263	957,866
Spain	36,039	36,521	39,521
UK	262	286	382
Grand Total	1,052,118	1,124,172	1,143,214

Exhibit 19 – Daimler Production by Year and Country; Source: OICA⁸

Manufacturer Porsche

Row Labels	Values		
	2006 Production	2007 Production	2008 Production
Porsche	98,512	107,170	96,721
Finland	32,393	23,026	16,145
Germany	66,119	84,144	80,576
Grand Total	98,512	107,170	96,721

Exhibit 20 – Porsche Production by Year and Country; Source: OICA⁸

Manufacturer	VW
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Row Labels	Values		
	2006 Production	2007 Production	2008 Production
Audi	924,085	978,300	1,026,617
Belgium	0	12,087	31,763
Germany	828,222	831,835	875,487
Hungary	23,675	56,982	60,359
Slovakia	72,188	77,396	59,008
Bentley	9,175	10,000	7,692
UK	9,175	10,000	7,692
Bugatti	44	83	82
France	44	83	82
Lamborghini	2,095	2,580	2,424
Italy	2,095	2,580	2,424
SEAT	422,631	412,937	380,576
Portugal	14,352	14,242	10,282
Spain	408,279	398,695	370,294
Skoda	555,291	615,435	613,081
Czech Rep.	555,291	615,435	594,688
Slovakia	0	0	18,393
VW	1,808,755	1,858,773	1,928,158
Belgium	179,333	64,461	53,177
Czech Rep.	0	0	2,271
Germany	1,100,242	1,284,761	1,321,885
Poland	89,373	75,212	83,452
Portugal	67,483	79,450	83,818
Russia	0	0	62,234
Slovakia	138,166	126,427	62,229
Spain	234,158	228,462	259,092
Grand Total	3,722,076	3,878,108	3,958,630

Exhibit 21 – Volkswagen Production by Year and Country; Source: OICA⁸

Clearly Porsche, Daimler, and BMW have retained a “German-centric” manufacturing strategy in recent years. Volkswagen however has stood out among its peers by shifting a large manufacturing burden to Eastern Europe, where in 2008 alone it opened new plants in the Czech Republic and Russia.

Before examining the effectiveness of these different strategies for the German automakers it is important to address the question: why off-shore? According to Diana Farrell, a director with the McKinsey Global Institute:

The ability to offshore depends on there being a pool of well-educated job candidates offshore, a sizable gap between their pay expectations and those of their peers in the employer's home market, robust distributed communications technology, a set of liberal trade rules, and growing confidence among companies in the stability of emerging markets.²⁴

In the case of Eastern Europe, many of these conditions apply, with the sizable labor cost gap being most evident. Below in Exhibit 22 is a survey taken in 2004 by the European Commission, which helps to highlight the sizeable difference between labor costs in Germany and all of the Eastern European countries which participated in the survey (Greece, Poland, and Hungary). The column on the left is the yearly average cost of a worker in manufacturing in general, and the column on the right is the yearly average cost of a worker specifically in the manufacture of motor vehicles, trailers, and semi-trailers:

nace	D - Manufacturing	DM34 - Manufacture of motor vehicles, trailers and semi-trailers
geo/time	2004A00	2004A00
DE1 Baden-Württemberg	€ 54,479.47	€ 68,672.86
DE2 Bayern	€ 51,610.73	€ 60,712.37
DE3 Berlin	€ 55,371.63	€ 63,012.48
DE4 Brandenburg	€ 36,467.92	€ 46,124.21
DE5 Bremen	€ 55,809.56	
DE6 Hamburg	€ 62,703.94	
DE7 Hessen	€ 53,290.03	€ 63,348.95
DE8 Mecklenburg-Vorpommern	€ 31,754.61	€ 31,134.13
DE9 Niedersachsen	€ 49,275.38	€ 63,923.73
DEA Nordrhein-Westfalen	€ 50,552.82	€ 58,006.33
DEB Rheinland-Pfalz	€ 51,116.34	€ 54,341.37
DEC Saarland	€ 47,577.74	€ 55,352.72
DED Sachsen	€ 33,275.12	€ 40,746.20
DEE Sachsen-Anhalt	€ 32,353.96	€ 33,295.37
DEF Schleswig-Holstein	€ 47,741.66	€ 52,553.82
DEG Thüringen	€ 31,722.19	€ 35,513.29
GR1 Voreia Ellada	€ 19,878.33	€ 29,529.40
GR2 Kentriki Ellada	€ 25,821.41	€ 19,971.79
GR3 Attiki	€ 27,254.64	€ 25,596.48
GR4 Nisia Aigaiou, Kriti	€ 20,867.74	
HU1 Közép-Magyarország	€ 12,216.08	€ 11,414.00
HU2 Dunántúl	€ 9,451.48	€ 13,651.45
HU3 Alföld és Észak	€ 8,554.44	€ 11,068.71
PL1 Centralny	€ 7,980.41	€ 7,547.84
PL2 Poludniowy	€ 7,456.97	€ 9,045.58
PL3 Wschodni	€ 6,362.42	€ 7,711.12
PL4 Północno-Zachodni	€ 6,719.77	€ 7,864.13
PL5 Poludniowo-Zachodni	€ 7,148.89	€ 9,496.44
PL6 Północny	€ 6,828.52	€ 6,501.26

Exhibit 22 – Comparison of Manufacturing Costs between German and Eastern European Regions;
Source: European Commission¹⁰

According to the survey, the average cost of manufacturing a motor vehicle in Germany per worker over a year comes out to €51,909.84. Compared to the 3 Eastern European countries included in the survey, Greece has an average of only €25,032.55, Hungary only €12,044.72, and Poland only €8,027.73. This means that personnel costs in Greece are 51.77% lower than in Germany, and accordingly these costs are 76.8% lower in Hungary and 84.54% lower in Poland.

Assuming that each percent change in personnel expenses affects the profit margin by .15 to .2 (as discussed in Section II, Production Costs within Germany) vehicles produced in Greece could have a roughly 7.7% to 10.3% higher profit margin than those produced within Germany. Likewise vehicles produced in Hungary could see an improvement of 11.5% to 15.4%, and vehicles in Poland could see an improvement of 12.7% to 16.9%.

Given Diana Farrell's argument that a liberal set of trade rules is vital to off-shoring production, shifting production to Eastern Europe specifically is also aided by the European Union, which since removing trade barriers internally in 1993 has "created several million jobs...and generated more than €800 billion in extra wealth."²⁵ Additionally, the passage of the Schengen agreement in the EU has made it conducive for Western European countries to invest in cheaper Eastern European labor markets.

However, there are still disadvantages to shifting production to Eastern European countries, with one specifically being a lower level of education outside Western Europe. Exhibit 23 shows the amount in Euros per year spent on education for students throughout Europe:

Annual expenditure on public and private educational institutions per pupil/student

By level of education (PPS based on full-time equivalents)

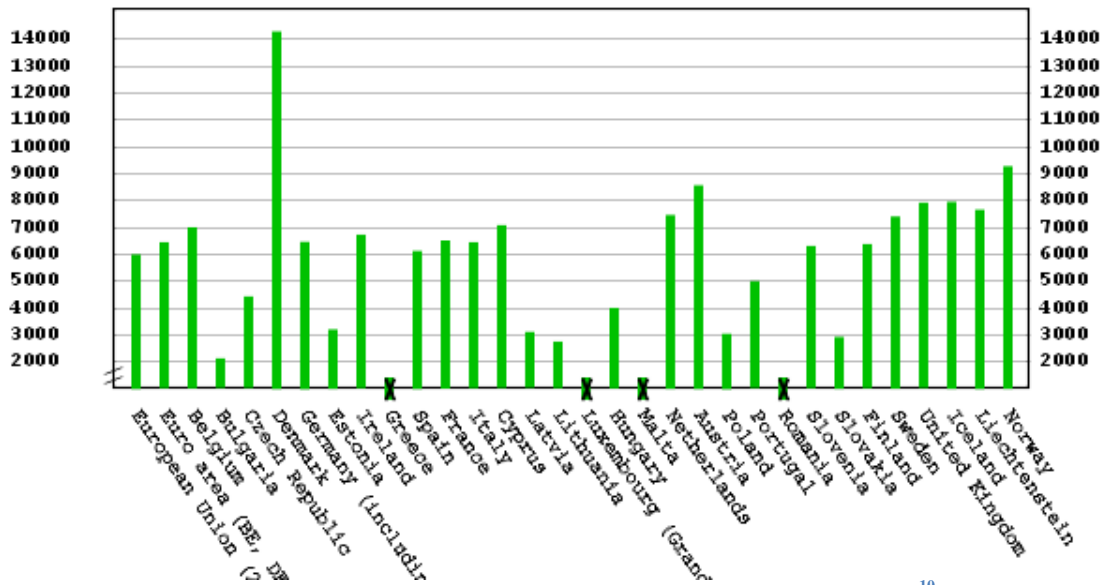


Exhibit 23 – Investment in Education; Source: European Commission¹⁰

Although Germany is far from being the leader in this category, the only Eastern European countries which exceed their expenditure on education are Cyprus and Slovenia. Hungary, Poland, Slovakia, and the Czech Republic, four countries where Volkswagen currently produces vehicles, all invest much less in education than the Euro Area. Of course this begs the question then as to why auto manufacturers would be interested in investing in countries where educational standards are much lower, and as to whether or not expenditure on education per capita is an accurate indicator of a good workforce. The problem therein lies that education in schools does not necessarily translate into employable skills.

Given that these Eastern European countries share such a close proximity to Germany and given the EU's policies towards the movement of people, it is not unlikely that German companies may shift some of their "brightest" employees to other countries in order to oversee operations and to handle the more technical aspects of production. This however would require that the workers sent out from Germany be able to communicate effectively with the Eastern

European employees, meaning that the amount of German spoken within these foreign countries may have a huge impact on strategic decisions.

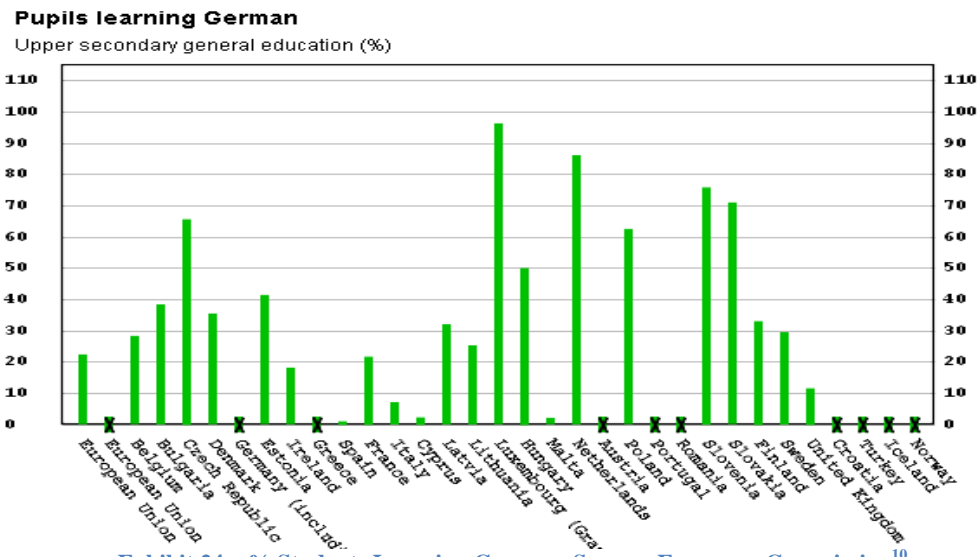


Exhibit 24 – % Students Learning German; Source: European Commission¹⁰

Of course it is no surprise in Exhibit 24 that the four of the five Eastern European countries with the biggest emphasis on learning German are Slovakia, Hungary, Poland, and the Czech Republic – coincidentally four Eastern European countries where Volkswagen has invested in production facilities.

Farrell's argument that robustly distributed communication technology be available is also worth mention. Although cell phones and email make it almost always possible to communicate with others regardless of where they are, there is still much to be said about how widespread the use of technology in general is in countries where companies may consider off shoring.

% of Individuals Who Have Never Used a Computer

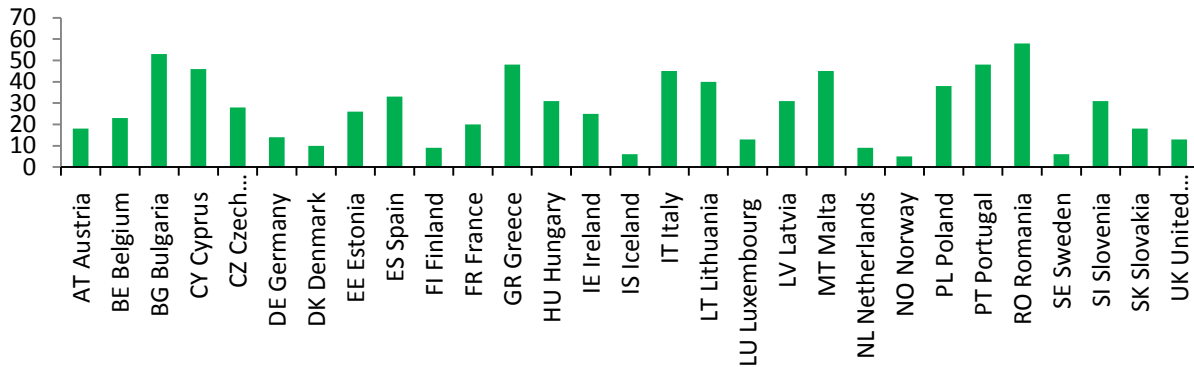


Exhibit 25 – % of Individuals Who Have Never Used a Computer; Source: European Commission¹⁰

In Exhibit 25, the percent of individuals who have never used a computer in a country is a relatively good measure of the workforce, because it shows whether or not a country's labor force is trained well enough to prosper in modern workday settings where computers are ubiquitous. In the case of Eastern European countries, however, there is a lack of familiarity with technology which makes these countries less attractive for off-shoring. Whereas less than 15% of individuals in Germany have never used a computer, this number is easily doubled in countries like Slovenia and Hungary, and in countries such as Bulgaria and Romania these numbers exceed 50%.

Beyond just the theoretical framework which Farrell puts forth though it is important to observe how effective the manufacturing plants of Volkswagen have been in terms of off-shoring.

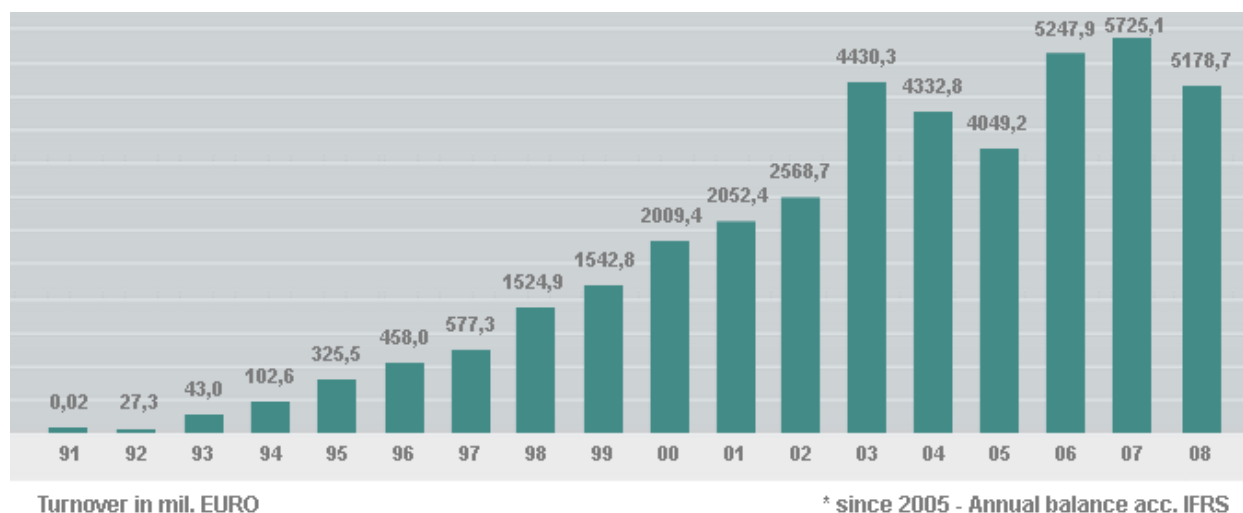


Exhibit 26 – Volkswagen Slovakia Turnover in mil. Euro; Source: Volkswagen Slovakia, a.s.²⁶

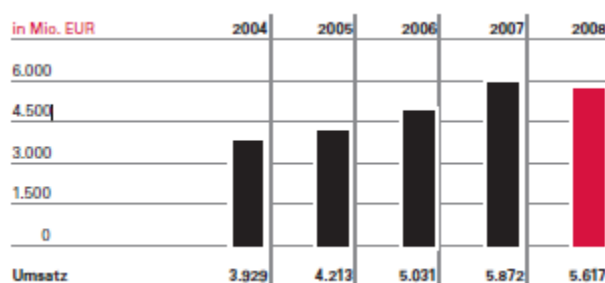


Exhibit 27 – Audi Hungaria Motor Kft. Turnover; Source: Audi Hungaria Motor Kft.²⁷

As seen in Exhibit 26, the growth of the sales turnover for the Volkswagen Slovakia plants has been staggering since 1991, especially from 2002 to 2008 when it more than doubled. Given employment of about 7,826 by VW Slovakia,¹¹ the 2008 turnover amounts to a staggering €61,730 per person employed. Audi Hungaria, whose sales turnover is shown in Exhibit 27, has an employment of 5,879 workers,²⁷ which translates into a sales turnover per person of €55,435 in 2008. When dividing this turnover per person by the average salary of a Hungarian automotive worker (which is €2,044.72, as outlined in Exhibit 22) one can see that Audi Hungaria's turnover per person employed is roughly 80 times the salary paid to that employee.

According to p. 138 of their financial report, 24.3% of Volkswagen's sales revenue in 2008 came from Germany.²⁰ Given that their total sales revenue/turnover for the year was €13,808,000,000²⁰ (p. 141), this translates into roughly €7,655,344,000 of their turnover

coming from Germany alone. Given 178,000 employees (p. 141), this averages out to €155,367 turnover per person employed, which is slightly more than 3 times the average yearly cost of a worker as outlined in Exhibit 22.²⁰

There are of course many factors which contribute to this massive gap between German auto worker efficiency and Eastern European auto worker efficiency. As measured in this fashion, a high amount of jobs in research and development and other upper management jobs effectively count against Germany's efficiency, since their salaries would be usually paid by the automaker in Germany, yet their results would arguably be seen in more than just the German divisions' bottom lines. Also the fact that many of the Eastern European plants are newer and therefore arguably have better technology may exaggerate the higher level of efficiency attainable in Eastern European countries. Even so, the gap in salaries paid to employees in Germany and in Eastern Europe is sizably different, and although the exact contribution of this factor to the difference in efficiency levels cannot be determined, it is regardless an extremely large, if not the largest, reason why "alternative" labor markets should be attractive to investment by German automakers.

Conclusion

I. Findings

There are of course a multitude of factors coming in to play when trying to assess the future of the automobile industry within Germany. Germany's domestic demand for automobiles has remained fairly stagnant since the "demand shock" of the fall of the Berlin Wall passed through. Given production within the country has increased, the growing gap between production and consumption has been accounted for by a strong increase in exports over the past decade.

However, the ever increasing cost of labor within Germany threatens the sustainability of this system. Whereas in the past many of the manufacturers would just open new factories in East Germany in order to lower costs, the opportunities for lowering labor costs now lay beyond the borders of the country, namely in Eastern Europe and Asia where the markets grew last year in spite of the global recession. Eastern Europe is an especially strong market to invest in for future production, given that the EU has made it easier for foreign direct investment to be funneled into those areas, and given that Eastern Europe still shares a fairly close cultural proximity to Germany in terms of language.

Thus as these alternative markets continue to grow and as the gap between the richer and poorer countries closes, further successful manufacturing strategies will absolutely involve German companies expanding their production capacity outside of their own country's borders.

II. Limitations of Findings and Opportunities for Further Research

The research conducted in this paper has been done mostly from an economics standpoint, i.e. in an absolutely free market economy rising costs of production in Germany coupled with a stagnating market would influence further production investments to occur outside of the country. There is arguably however an extremely important influence in this equation which has largely been left out of the analysis, namely the German government. The states in Germany, or the *Bundesländer*, have a unique influence over the affairs of many German companies, being that many states are key shareholders of the largest companies in their region. This being the case, it is not unreasonable to believe that government and politics could play a very significant role in each company's investment decisions, which could arguably be strong enough to overpower some of the underlying economic forces at play. Given that German labor unions also have much more power than comparable unions in the United States, it is not unreasonable to believe that the workers themselves have the power to influence the states to influence the companies in a sort of roundabout fashion. Being however out of scope for this economic analysis, a political analysis of the interaction between German companies, German labor unions, and the German government especially in regards to the automotive industry could further reveal some key issues in measuring the future stability of production within Germany.

Appendix I

Exhibit 28, Exhibit 29, and Exhibit 30 show the raw data sources used to show an overlap between data sources, as mentioned in the Research Methodology section of this paper.

6.5 Registration of passenger vehicles in EU-27 - 2006-2008

	2006	2007	2008	Evolution 07-08	Evolution 06-08
AT	308,594	298,182	293,697	-1.5%	-4.8%
BE	526,141	524,798	535,947	2.1%	1.9%
DK	156,934	162,684	149,967	-7.8%	-4.4%
FI	145,700	125,617	139,647	11.2%	-4.2%
FR	2,000,549	2,064,543	2,050,282	-0.7%	2.5%
DE	3,467,961	3,148,163	3,090,040	-1.8%	-10.9%

Exhibit 28 – IRF Registration Statistics for Select EU Countries; Source: European Road Statistics²³ p. 25

Neuzulassungen

1. Neuzulassungen

	2007	2008 *)	Veränd. in %
Personenkraftwagen	3.148.163	3.090.040	-1,8
Nutzfahrzeuge	334.116	334.999	0,3
davon			
Lkw bis 6 t zul. Ges.-Gew.	222.390	224.439	0,9
Lkw über 6 t zul. Ges.-Gew.	52.357	50.611	-3,3
Omnibusse	5.471	5.886	7,6
Sattelzugmaschinen	39.782	39.024	-1,9
übrige Kraftfahrzeuge	14.116	15.039	6,5
Kraftwagen insgesamt	3.482.279	3.425.039	-1,6
Kraftfahrzeughänger	265.516	260.241	-2,0

Exhibit 29 – VDA Registration Statistics for Germany; Source: VDA²⁸

New Registrations in EUROPE*													
By Country - 2008													
Country	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
PC -Passenger Cars													
Austria	21,884	21,987	29,907	31,813	28,364	34,713	22,695	18,285	22,509	25,992	19,836	15,712	293,697
Belgium	56,846	55,941	57,077	61,703	48,441	50,689	39,242	32,954	37,838	42,998	30,381	21,837	535,947
Denmark	14,391	12,953	12,245	16,074	14,575	15,345	12,974	11,336	11,993	11,326	8,327	8,604	150,143
Finland	21,549	12,056	12,625	15,494	14,218	12,142	11,177	9,446	9,842	10,153	6,445	4,464	139,611
France	162,116	175,126	188,879	198,558	184,463	219,753	182,954	103,350	160,565	174,939	145,893	153,686	2,050,282
Germany	220,742	228,623	286,549	317,960	275,259	304,036	262,534	214,386	261,384	258,814	233,772	225,981	3,090,040

Exhibit 30 – ACEA Registration Statistics; Source: ACEA²⁹

Appendix II

Exhibit 31 below shows how marginal changes in the personnel expenses category affect the overall profit margin for Volkswagen. The revenue and cost of goods sold items from 2004-2008 are taken directly from the Volkswagen 2008 Annual Report, and are averaged out to assist in further calculation. The data table at the bottom of the exhibit is created by picking arbitrary percentages for the “% Personnel Expenses of CoGS” ranging from 14% to 20%, and increasing in half percentage point intervals. By taking these percentages and multiplying them by the average CoGS over the 5 year period, the cost of personnel at a given percentage can be calculated. From there the personnel expense is added to the average Cost of Materials and the average “Difference” (i.e. overhead costs) in order to calculate the CoGS. Subtracting each CoGS from the average Sales Revenue gives the Gross Profit, and using a data table in Excel and by pointing to the average Gross Profit as the “Column Input Cell” the Profit Margin at each “% Personnel Expenses of CoGS” level can be calculated. By taking the difference between profit margins at each interval, it becomes clear that every .5% increase in Personnel Expenses relative to CoGS causes a .43% decrease in Profit Margin, and therefore every 1% increase in Personnel Expenses relative to CoGS causes a .86% decrease in the Profit Margin.

Volkswagen Income Statement							
		2008	2007	2006	2005	2004	Avg
Sales Revenue		113,808	108,897	104,875	93,996	88,963	102,108
Cost of Goods Sold		96,612	92,603	91,020	81,733	78,430	88,080
Gross Profit		17,196	16,294	13,855	12,263	10,533	14,028
Profit Margin		15.11%	14.96%	13.21%	13.05%	11.84%	13.74%
Cost of Materials		75,954	72,340	66,935	62,620	58,239	67217.6
Personnel Expenses		15,784	14,549	17,400	14,796	14,038	15313.4
Difference		4,874	5,714	6,685	4,317	6,153	5548.6
% personnel expenses of CoGS		16.34%	15.71%	19.12%	18.10%	17.90%	17.39%
% personnel expenses of CoGS	Personnel Cost	CoGS	Gross Profit	Profit Margin	Difference in PMs		
14.0%	\$ 12,331.14	\$ 85,097.34	\$ 17,010.46	16.66%			
14.5%	\$ 12,771.54	\$ 85,537.74	\$ 16,570.06	16.23%	0.43%		
15.0%	\$ 13,211.94	\$ 85,978.14	\$ 16,129.66	15.80%	0.43%		
15.5%	\$ 13,652.34	\$ 86,418.54	\$ 15,689.26	15.37%	0.43%		
16.0%	\$ 14,092.74	\$ 86,858.94	\$ 15,248.86	14.93%	0.43%		
16.5%	\$ 14,533.13	\$ 87,299.33	\$ 14,808.47	14.50%	0.43%		
17.0%	\$ 14,973.53	\$ 87,739.73	\$ 14,368.07	14.07%	0.43%		
17.5%	\$ 15,413.93	\$ 88,180.13	\$ 13,927.67	13.64%	0.43%		
18.0%	\$ 15,854.33	\$ 88,620.53	\$ 13,487.27	13.21%	0.43%		
18.5%	\$ 16,294.73	\$ 89,060.93	\$ 13,046.87	12.78%	0.43%		
19.0%	\$ 16,735.12	\$ 89,501.32	\$ 12,606.48	12.35%	0.43%		
19.5%	\$ 17,175.52	\$ 89,941.72	\$ 12,166.08	11.91%	0.43%		
20.0%	\$ 17,615.92	\$ 90,382.12	\$ 11,725.68	11.48%	0.43%		

Exhibit 31 – Data Showing How Changes in Personnel Costs Affects VW’s Profit Margin; Source: VW Annual Report 2008²⁰

Similar calculations for Daimler are shown below in Exhibit 32, albeit formatted differently for brevity. In this case a 3 year average is used, and the “Decrease in Personnel Expenses” category is used to measure the affect of marginal changes in personnel expenses on the profit margin.

Daimler AG				
	2008	2007	2006	Avg.
Revenue	95,873	99,399	99,222	98,165
CoGS	74,314	75,404	78,782	76,167
Non-personnel Costs	59,122	55,148	55,208	56,493
Personnel Costs	15,192	20,256	23,574	19,674
Gross Profit	21,559	23,995	20,440	21,998
Profit Margin	22.49%	24.14%	20.60%	22.41%
% of Personnel Expenses to CoGS	20.44%	26.86%	29.92%	25.83%
Decrease In Personnel Expense	Overall Personnel Expense	Profit Margin	Change in PM	
5%	18,690	23.41%		
10%	17,707	24.41%	1.00%	
15%	16,723	25.42%	1.00%	
20%	15,739	26.42%	1.00%	
25%	14,756	27.42%	1.00%	
30%	13,772	28.42%	1.00%	
35%	12,788	29.42%	1.00%	
40%	11,804	30.43%	1.00%	
45%	10,821	31.43%	1.00%	
50%	9,837	32.43%	1.00%	
55%	8,853	33.43%	1.00%	
60%	7,870	34.43%	1.00%	

Exhibit 32 – Affect of Personnel Expense Changes on Daimler's Profit Margin; Source: Daimler AG 2008 Annual Report²¹

Works Cited

- ¹ Fujimara, Naoki. Bloomberg.com. 28 December 2008. 1 September 2009
<<http://www.bloomberg.com/apps/news?pid=20601087&sid=aIbkwkK56i0g>>.
- ² European Automobile Manufacturers' Association. 2009. 9 September 2009
<http://acea.thisconnect.com/index.php/country_profiles/detail/germany>.
- ³ Ballew, Paul. BNET. October 1994. 28 August 2009 <http://findarticles.com/p/articles/mi_m1094/is_n4_v29/ai_16338970/pg_6/?tag=content;coll1>.
- ⁴ European Automobile Manufacturers' Association. 2009. 1 September 2009
<http://www.acea.be/images/uploads/country_profiles/germany.png>.
- ⁵ International Monetary Fund. imf.org. October 2008. 14 September 2009 <<http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/weorept.aspx?sy=2006&ey=2013&scsm=1&ssd=1&sort=subject&ds=.&br=1&pr1.x=71&pr1.y=11&c=122%2C136%2C124%2C137%2C423%2C181%2C172%2C138%2C132%2C182%2C134%2C961%2C174%2C184%2C178&s=NGDPRPC%2CPPPGDP%2CPPPPC>>.
- ⁶ Eurostat. 2009. 13 September 2009 <<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsieb010>>.
- ⁷ The Brussels Programme Centre of the International Road Federation (IRF). "The European Union Federation (ERF)." 2009. 14 September 2009 <<http://www.irfnet.eu/en/2009-road-statistics>>.
- ⁸ OICA. "2008 Production Statistics." 2009. OICA. 9 October 2009 <<http://oica.net/category/production-statistics/>>.
- ⁹ VDA. Zahlen & Fakten - Export. 2009. <http://www.vda.de/de/zahlen/jahreszahlen/export/index.html> (accessed November 2, 2009).
- ¹⁰ European Commission. Eurostat. 21 September 2009. 21 September 2009
<http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database>.

-
- ¹¹ Volkswagen AG. VW Production Plants. 31 December 2008. 21 September 2009 <http://www.volkswagenag.com/vwag/vwcorp/content/en/the_group/production_plants.html>.
- ¹² Daimler AG. Daimler Locations. 2009. 21 September 2009 <<http://www.daimler.com/dccom/0-5-535024-1-634251-1-0-0-0-0-0-7751-0-0-0-0-0-0-0.html>>.
- ¹³ BMW Group. BMW Leipzig. September 2009. 21 September 2009 <<http://www.bmw-werk-leipzig.de/leipzig/deutsch/lowband/com/en/index.html>>.
- ¹⁴ BMW Group. BMW Group. 4 May 2009. 21 September 2009 <http://www.bmwgroup.com/bmwgroup_prod/e/nav/index.html?http://www.bmwgroup.com/bmwgroup_prod/e/0_0_www_bmwgroup_com/home/home.html>.
- ¹⁵ BMW Group. BMW Wackersdorf. September 2009. 21 September 2009 <http://www.bmw-werk-wackersdorf.de/wackersdorf/english/index_home.html>.
- ¹⁶ BMW Group. BMW Regensburg. September 2009. 21 September 2009 <<http://www.bmw-werk-regensburg.de/lowband/com/en/index.html>>.
- ¹⁷ BMW Group. BMW Dingolfing. September 2009. 21 September 2009 <<http://www.bmw-werk-dingolfing.de/dingolfing/htdocs/lowband/com/en/index.html>>.
- ¹⁸ BMW Group. BMW Landshut. September 2009. 21 September 2009 <<http://www.bmw-werk-landshut.de/lowband/com/en/index.html>>.
- ¹⁹ BMW Group. BMW Munich. September 2009. 21 September 2009 <<http://www.bmw-plant-munich.com/lowband/com/en/index.html>>.
- ²⁰ Volkswagen AG. "2008 Volkswagen Annual Report." 2009. Volkswagen. 28 September 2009 <http://www.volkswagenag.com/vwag/vwcorp/info_center/en/publications/2009/03/GB_2008.-bin.acq/qual-BinaryStorageItem.Single.File/Y_2008_e.pdf>.
- ²¹ Daimler AG. 2009. Daimler AG. 28 September 2009 <http://www.daimler.com/Projects/c2c/channel/documents/1677323_DAI_2008_Annual_Report.pdf>.

-
- ²² BMW Group. "Annual Report 2008." 2009. BMW Group. 28 September 2009
<http://www.bmwgroup.com/annualreport2008/_downloads/BMW_Group_2008.pdf>.
- ²³ IRF. "European Road Statistics 2009." 2009. 26 October 2009 <http://www.irfnet.eu/media/stats/ERF-2009%20European%20Union%20Road%20Statistics%20BOOKLET_V07_update.pdf>.
- ²⁴ Farrell, Diana. "Understanding Offshoring." Institute, McKinsey Global. Offshoring. Boston: Harvard Business School Press, 2006.
- ²⁵ The European Union. "Policy Areas - Internal Market." 23 November 2009. 30 November 2009 <http://europa.eu/pol/singl/index_en.htm>.
- ²⁶ Volkswagen Slovakia, a.s. Volkswagen Slovakia. 2009. 19 October 2009
<<http://www.volkswagen.sk/en/about-us/vw-sk-in-numbers/>>.
- ²⁷ Audi Hungaria Motor Kft. "Jahresbericht 2008." Audi AG. 2009. 19 October 2009 <http://www.audi.hu/deu/profil/jahresbericht_2008.pdf>.
- ²⁸ VDA. "Zahlen & Fakten - Neuzulassungen." 2009. 2 November 2009
<<http://www.vda.de/de/zahlen/jahreszahlen/neuzulassungen/>>.
- ²⁹ ACEA. "New Vehicle Registrations - By Country." 2009. 26 October 2009 <http://www.acea.be/index.php/news/news_detail/new_vehicle_registrations_by_country/>.

Academic Vita

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Education

The Pennsylvania State University

University Park, PA

Bachelor of Science – Supply Chain and Information Systems

Class of 2010

- ▶ Double Major in German BS (business option) and Minor in International Business
- ▶ Schreyer Honors Scholar 2008-Pres.

IES Study Abroad Berlin – Humboldt Universität

Sept. 2008-Dec. 2008

Experience

Becton Dickinson

Franklin Lakes, NJ

May 2009-Aug. 2009

Transportation Intern

- ▶ Identified cost saving opportunities on both domestic and international transportation levels
- ▶ Completed a summer long network study, which focused on improving the level of coordination between various distribution centers and trading centers in Latin America
- ▶ Helped to develop common labeling practices within the region which could potentially save on average 2 weeks of cycle time within certain countries
- ▶ Created Visual Basic Macros to automate report generation from data out of various information systems such as SAP R/3 and BW; Created macro which allowed company to generate roughly \$80,000 of paperwork for U.S. customs in less than 3 hours

PHH Arval

Sparks, MD

May 2007-Aug. 2008

Out of Stock Intern

- ▶ Located emergency vehicles for corporate clients in a timely fashion
- ▶ Managed a network of suppliers consisting of over 100 car dealerships across the nation
- ▶ Facilitated everyday workflow and provided suggestions for improvements in process flow, employee morale, and IT implementation to management
- ▶ Exceeded expected cycle time and service metrics of not only interns but also of full time employees

Honors, Skills, and Involvement

RISE Professional Scholarship Recipient - 2010

Ralph H. "Sam" Wherry Scholarship Recipient – 2008-2009 & 2009-2010

Boeing Company Charitable Trust Scholarship Recipient – 2008-2009 & 2009-2010

2008 Boeing Supply Chain Management Competition – 2nd Place

Bilingual (Native English, Fluent German)

Proficiency with Microsoft Office, VBA, SAP, BW/BI, HTML, CSS, Minitab

Literature

- ▶ 2010 Honors Thesis: Manufacturing Trends in the German Automotive Industry
- ▶ Skills of Central Pennsylvania/Willowbank Food Facility Business Plan
- ▶ Jtwo Films, Inc. Business Plan