Evolving Geography of Automobile Manufacturing in North America

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Outline

• Three layers of auto industry geography
  – North America
  – U.S. relative to Canada and Mexico
  – Industry footprint within the U.S.

• Recap: Chrysler and GM Rescue of 2008/2009
• Vehicle assembly – a primer
• Summary
Parts and vehicle assembly co-locate

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Most vehicles produced where sold

U.S. light vehicle sales by major production region

NAFTA

Asia

Europe
### Within N. America, gains for Mexico

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>2007</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>16</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Mexico</td>
<td>6</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>U.S.</td>
<td>78</td>
<td>70</td>
<td>67</td>
</tr>
<tr>
<td>N. America</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Exports drive Mexico’s growth

Mexico’s light vehicle exports

Annual exports have increased by 2.3 million units since 1985
Those exports go north and south

Vehicle exports from Mexico by destination

<table>
<thead>
<tr>
<th>Region</th>
<th>2012 export share</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAFTA</td>
<td>71%</td>
</tr>
<tr>
<td>Latin America</td>
<td>16%</td>
</tr>
<tr>
<td>Europe</td>
<td>9%</td>
</tr>
<tr>
<td>Africa</td>
<td>2%</td>
</tr>
<tr>
<td>Asia</td>
<td>2%</td>
</tr>
</tbody>
</table>

In 2013, 82% (2.38 million units) of Mexico’s LV production was exported.
Emergence of auto alley in U.S.

• Two main factors:

  – Detroit carmakers abandon the “branch plant” assembly system.
  – Overseas-headquartered carmakers enter the U.S. and Canada as producers.
From manufacturing belt...
...to auto alley

Last year, auto alley captured nearly 90% of U.S. light vehicle production.

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Where to locate a new assembly plant?

Example: Toyota decision in 2007
Close-up of auto alley
Production share and geography

U.S. light vehicle production share

1980

Detroit 3

Europe

Asia

2013

53%

6%

41%

97%

3%
From 4 to 14 producers in 30 years

Foreign carmakers, by first year of producing in U.S.

<table>
<thead>
<tr>
<th>Carmaker</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>VW (1)</td>
<td>1978</td>
</tr>
<tr>
<td>Honda</td>
<td>1982</td>
</tr>
<tr>
<td>Nissan</td>
<td>1983</td>
</tr>
<tr>
<td>Toyota</td>
<td>1984</td>
</tr>
<tr>
<td>Mitsubishi, Mazda</td>
<td>1987</td>
</tr>
<tr>
<td>Subaru</td>
<td>1989</td>
</tr>
<tr>
<td>BMW</td>
<td>1994</td>
</tr>
<tr>
<td>Mercedes</td>
<td>1997</td>
</tr>
<tr>
<td>Hyundai</td>
<td>2005</td>
</tr>
<tr>
<td>Kia</td>
<td>2009</td>
</tr>
</tbody>
</table>

(1) Closed in 1989, new plant opened in 2011
In 1985 Detroit dominates
Today: two distinct footprints
Growth concentrated in the South

U.S. light vehicle production within auto alley

Percent

100
90
80
70
60
50
40
30
20
10
0


Auto alley share

Northern half

Southern half

D3 share:

72%

19%

Note: North = WI, IL, MI, IN, OH    South = KY, TN, AL, MS, GA, SC
Recap: Emergency industrial policy

December 2007
Key: Significant restructuring for Detroit

Capacity reduction
GM -31%
Chrysler -22%
Ford -8%

Detroit 3 close 15 assembly plants, 13 of those in the U.S.

Source: Klier and Rubenstein, FRB Chicago
Profitability followed

Profit per vehicle, North America

Source: McAlinden and Chen, Center for Automotive Research
Is “flat” the new normal?

U.S. light vehicle production, annual shares

Detroit 3

Asia

Europe

Percent

YTD
Assembly of vehicles
Assembly of vehicles
Assembly of vehicles
Supply networks are regional
Summary

• North America remains a viable location of light vehicle production.
• Within North America, Mexico has been gaining vehicle production share. Currently, re-shoring from Asia to North America leads to Mexico, especially for small cars.
• Within the U.S., auto alley dominates vehicle production geography. Growth within auto alley is linked to the fortunes of carmakers.
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