Understanding the Potential Impacts in Rome from the Marcy Nanocenter Project

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Bergmann Associates &
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About Camoin Associates

Camoin Associates has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. Through the services offered, Camoin Associates has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $600 million. Our reputation for detailed, place-specific, and accurate analysis has led to projects in 28 states and garnered attention from national media outlets including *Marketplace* (NPR), *Forbes* magazine, and *The Wall Street Journal*. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. The firm currently has offices in Saratoga Springs, NY; Portland, ME; and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at www.camoinassociates.com. You can also find us on Twitter @camoinassociate and on Facebook.

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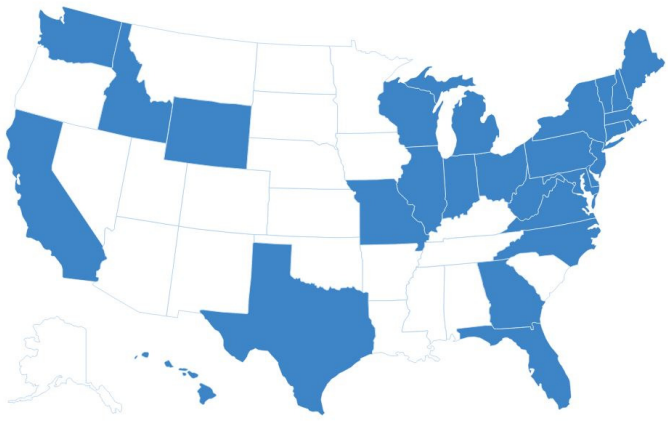

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Executive Summary

- In the City of Rome, the Marcy Nanocenter project will primarily impact the residential sector of the city's real estate market. Significant new housing demand will be created by the project, with most of the initial demand being for high-end to luxury apartments. Locations rich in amenities are likely to be the most competitive in attracting workers at the fab plant. Downtown Rome is within commuting distance of the Marcy project and is therefore well-positioned to absorb a significant number of residential units. There is currently a lack of high-end housing in the region, making apartment development more feasible.
- Workers at Marcy will have higher incomes, on average, compared to existing residents and will have disposable income available to spend on dining and entertainment. This is likely to enhance the retail, restaurant, and entertainment market. The regional market will be able to absorb several new higher-end restaurants as a result of the Marcy project. Our analysis indicates that demand for approximately 18,300 square feet of restaurant space will be generated. Put another way, that would be about 4 to 5 new restaurants. Where these restaurants can be absorbed will depend greatly on where new residential development occurs.
- The Marcy project is anticipated to generate demand for at least 75,000 square feet of office space in the region from the spinoff effects to industry sectors that use office space. There may be enough regional demand generated for office space for downtown Rome to absorb some new office development. Specifically, an office product geared towards short-term tenants may find success in Rome. This type of product would feature fully-furnished, flexible office space. New downtown amenities and rental housing (including short-term rentals) would enhance the viability of this type of development.
- The results of the economic impact analysis showed that one of the most significant indirect impacts of the new jobs will be growth in the health care sector. New medical office development may therefore be feasible in downtown Rome. The potential for medical office development is explored in a separate analysis conducted by Camoin Associates as part of the Downtown Rome BOA Step 3 project.
- Supply chain businesses will mostly be accommodated at the Marcy site itself, although Griffiss Park will likely absorb some spinoff R&D-related activity. Cheaper land prices in closer proximity to the Thruway means that Rome will not be able to compete for much of the industrial development activity. Overall, about 33,000 square feet of warehousing/storage space and 9,500 square feet of flex industrial space could be absorbed in the region in the future as a result of the project.
- The project will also generate potential demand for approximately 62,000 square feet of retail space (the equivalent of about 7 new retail businesses based on Oneida County averages). Some retail development may be feasible in Rome; however, the existing supply of available retail space is likely to absorb some of this demand, diminishing the potential for new development. Retail potential in downtown Rome will be largely proportional to the amount of new residential development.

Introduction

The Marcy Nanocenter is being developed in nearby Utica and will feature state-of-the-art semiconductor manufacturing facilities with 1,000 to 2,000 new jobs. This mega-project is likely to influence the real estate market in both Utica and Rome. Camoin Associates was tasked with examining what these potential impacts will be and whether there is potential for Rome to capture new industrial, commercial, residential, or other "spin-off benefits" from the Marcy project.

This analysis looks at the supply chain of the semiconductor industry and specifically how the supply chain linkages may play out in terms of local development by examining GlobalFoundries, a similar project in upstate New York. An economic impact analysis was also undertaken to understand some of the other indirect impacts including impacts from the spending of the new workers that will locate in the region.

About the Marcy Nanocenter

Marcy Nanocenter is part of the SUNY Polytechnic Institute campus and features 428 acres. The new project is a building complex featuring a state-of-the-art semiconductor chip manufacturing facility just north of Utica, which will be managed by the SUNY Polytechnic Institute. The "chip fab" will be leased to AMS AG, an Austrian company. A second facility, Quad-C, is planned as a research and chip commercialization facility.

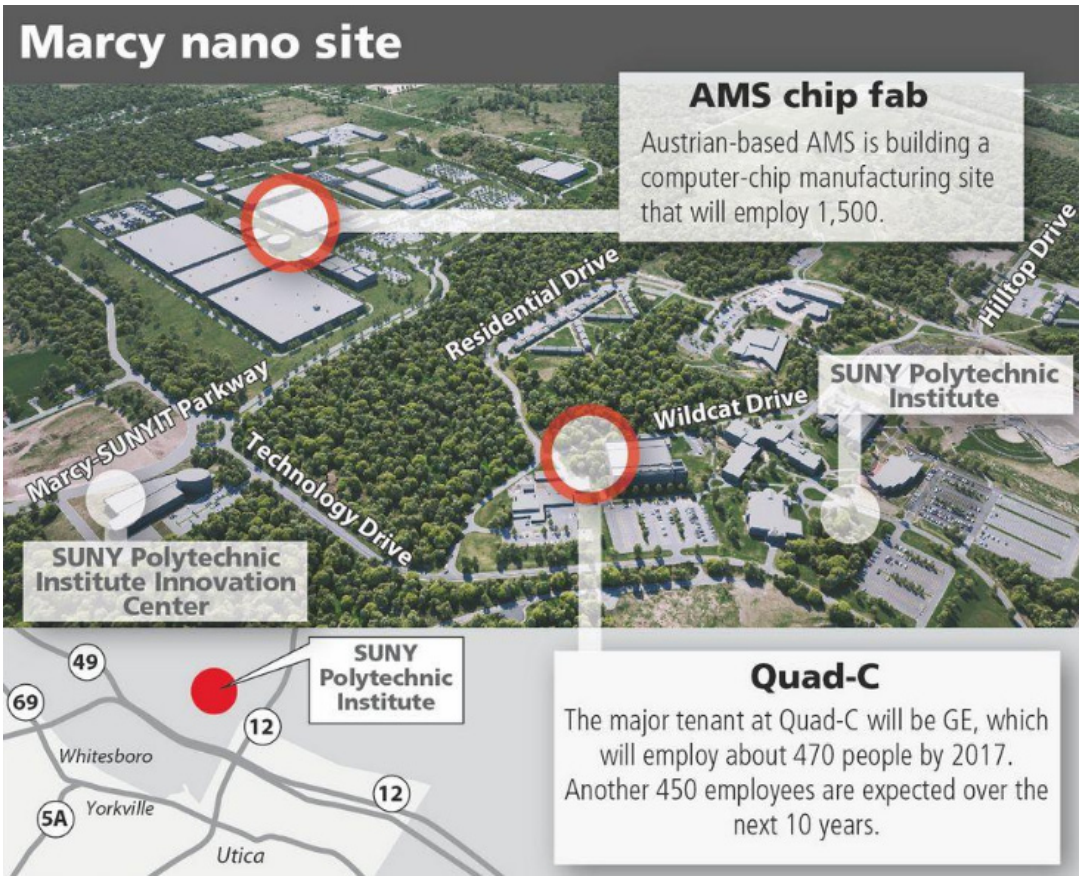
Job creation figures have been a moving target. The economic impact analysis conducted by Semico Research Corporation estimates that by 2020 there will be 273 fab workers with a multiplier job impact resulting in an additional 1,479 jobs in the local economy. By 2027, direct fab operations jobs will peak at 1,000, resulting in a combined job creation total of 6,452 (including direct and indirect jobs). The table below from the Semico report shows the projected timeline for construction jobs and full-time jobs at the for the AMS project only, including multiplier jobs.

Table 21: Project Jobs

Direct Jobs	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Property Prep	33	75	38									
Construction	193	709	225									
Fab Operation	0	3	38	93	273	468	506	510	603	742	940	1000
Total Direct Jobs	227	787	301	93	273	468	506	510	603	742	940	1000
Multiplier Jobs												
Property Prep	254	791	191									
Construction	309	1,131	360									
Fab Operation	0	12	151	370	1,086	1,862	2,013	2,029	2,399	2,953	3,741	3,981
Construction Materials	190	564	186									
Fab Inputs	0	0	26	65	392	686	726	726	840	1,072	1,384	1,471
Total Multiplier Jobs	752	2,497	913	435	1,479	2,549	2,739	2,755	3,239	4,024	5,125	5,452
Total Jobs	979	3,283	1,214	528	1,752	3,017	3,245	3,265	3,842	4,766	6,065	6,452

Source: M&W, MVEdge and Semico Research

The Utica Observer-Dispatch reports that the AMS chip fab will employ 1,500 while Quad-C, with GE as its major tenant, will employ 470 people by 2017 plus another 450 over the following 10 years for a total of 920. The graphic below summarizes these job totals.



Source: Utica Observer-Dispatch

Semiconductor Manufacturing Supply Chain

This section provides an overview of the semiconductor manufacturing supply chain including which sectors provide inputs to the industry, and which sectors purchase outputs from the industry. Industries in the supply chain represent potential new demand for local real estate space in the Utica/Rome region. The semiconductor supply chain is heavily globalized and whether businesses in the supply chain locate in the region depends on a variety of complex factors. To better understand the potential for businesses in these industries to locate in the region, additional analysis is provided in the following sections.

The diagram below provides an overview of the semiconductor manufacturing supply chain. The supply and demand industries are described in further detail below.

Source: IBISWorld

Key Buying Industries

- **Manufacturing:** The major industries that use products from this industry include: Electrical Equipment, Appliance, and Component Manufacturing; Computer and Electronic Product Manufacturing; Machinery Manufacturing; and, Transportation Equipment Manufacturing.
- **Navigational Instrument Manufacturing:** This industry primarily manufactures navigational, measuring and control instruments. Electrical equipment such as laser diodes, electron tube parts, and fuses are inputs into products of this industry.
- **Wireless Telecommunications Carriers:** This industry is a major end-user of industry products and operates and maintains switching and transmission facilities to provide direct communication through radio-based cellular networks.

Key Selling Industries

- **Chemical Product Manufacturing:** This industry manufactures photomasks used by this industry to print integrated circuits.
- **Aluminum Manufacturing:** This industry manufactures metal used in production of semiconductors by industry players.
- **Copper Rolling, Drawing & Extruding:** This industry manufactures metal used in the production of transistors by industry players.
- **Semiconductor Machinery Manufacturing:** This industry produces machinery necessary for semiconductor manufacturing.

GlobalFoundries Regional Supply Chain

The following table shows a supply leakage analysis for the semiconductor manufacturing industry in the Capital Region[1]. It details the amount of money the semiconductor industry spends on its top resource requirements, including the proportion spent inside the region as compared to outside of the region.

The results highlight specific industries from which a significant share of purchases are made. For example, 47% of Professional, Scientific, and Technical Services purchases are made within the Capital Region. This category also represents the most significant component of the supply chain with nearly $16 million in purchases required each year. Computer and Electronic Product Manufacturing is another industry from which in-region purchases are made by semiconductor manufacturing businesses with 65% of total purchases from this industry being made within the Capital Region. Administrative and Support Services; Merchant Wholesalers, Durable Goods; Merchant Wholesalers, Nondurable Goods; and Real Estate are other locally impacted industries in the supply chain.

[1] The Capital Region is defined in this context as Albany, Saratoga, Schenectady, and Rensselaer counties.

Semiconductor Manufacturing Supply Chain Analysis: Region				
NAICS	Purchases from	Total Purchases	% In-region Purchases	In-region Purchases
541	Professional, Scientific, and Technical Services	$15,792,738	47.2%	$7,455,623
325	Chemical Manufacturing	$11,868,266	5.5%	$654,702
551	Management of Companies and Enterprises	$11,830,163	10.6%	$1,249,444
334	Computer and Electronic Product Manufacturing	$10,785,780	64.5%	$6,959,617
331	Primary Metal Manufacturing	$9,884,981	0.1%	$11,349
561	Administrative and Support Services	$7,586,008	32.7%	$2,477,303
423	Merchant Wholesalers, Durable Goods	$7,097,685	30.6%	$2,172,295
332	Fabricated Metal Product Manufacturing	$6,952,322	11.0%	$766,841
424	Merchant Wholesalers, Nondurable Goods	$4,462,473	28.2%	$1,260,311
531	Real Estate	$3,486,297	49.5%	$1,724,805
425	Wholesale Electronic Markets and Agents and Brokers	$2,903,410	33.5%	$973,130
326	Plastics and Rubber Products Manufacturing	$2,900,576	2.4%	$69,996
327	Nonmetallic Mineral Product Manufacturing	$2,068,104	26.3%	$544,227
221	Utilities	$2,037,584	45.0%	$917,534
484	Truck Transportation	$1,728,350	25.0%	$431,675
335	Electrical Equipment, Appliance, and Component Manufacturing	$1,511,308	8.0%	$120,749
811	Repair and Maintenance	$1,187,620	37.7%	$447,485
324	Petroleum and Coal Products Manufacturing	$1,036,119	0.1%	$1,395
333	Machinery Manufacturing	$969,937	16.0%	$155,180
321	Wood Product Manufacturing	$935,037	16.4%	$153,115
337	Furniture and Related Product Manufacturing	$892,522	3.1%	$27,971
522	Credit Intermediation and Related Activities	$891,587	38.8%	$346,047
517	Telecommunications	$841,704	63.8%	$536,800
533	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$738,209	29.2%	$215,736
336	Transportation Equipment Manufacturing	$571,840	8.1%	$46,371
238	Specialty Trade Contractors	$568,661	57.1%	$324,670
482	Rail Transportation	$531,943	45.1%	$239,670
519	Other Information Services	$516,605	16.0%	$82,518
511	Publishing Industries (except Internet)	$488,555	49.7%	$242,910
322	Paper Manufacturing	$422,282	3.9%	$16,473
515	Broadcasting (except Internet)	$362,936	48.7%	$176,794
562	Waste Management and Remediation Services	$330,568	45.4%	$150,171
493	Warehousing and Storage	$294,992	62.8%	$185,172
483	Water Transportation	$278,969	0.7%	$1,871
441	Motor Vehicle and Parts Dealers	$237,780	35.6%	$84,745
532	Rental and Leasing Services	$237,591	39.5%	$93,926
518	Data Processing, Hosting, and Related Services	$237,349	48.0%	$113,810
236	Construction of Buildings	$234,351	69.5%	$162,904

Source: EMSI

In-Region Purchases > $1 million

In-Region Purchases $500,000 to $1 million

The Local Impact of GlobalFoundries Supply Chain Development

To understand the spinoff activity that may be associated with the Marcy Nanocenter project, we looked at the GlobalFoundries development in Malta, New York. GlobalFoundries is a semiconductor manufacturing facility with over 3,000 workers in upstate New York. The facility began construction in 2009 and started mass producing chips in 2012.

GlobalFoundries has a global supply network dependent on air freight. Inputs are mostly trucked 200 miles between the facility and John F. Kennedy International Airport in New York. Some materials arrive via ocean borne containers. The silicon wafers themselves come from Soitec in Grenoble, France and other suppliers in Asia. Downstream in the supply chain, the finished chips are shipped all over the world, although 70% of purchasers are located in Silicon Valley.[2]

Despite the global nature of the industry's supply chain, several companies established plants and offices locally to serve the GlobalFoundries' facilities. A logistics service provider, Panalpina, set up an office in Malta with eight employees to manage air and ocean freight shipments. A French industrial gas company, Air Liquide, built an 80,000 square foot industrial gas yard in the Luther Forest Technology Center (where GlobalFoundries is located) to make and provide specialty gases for the plant.

Some of the local equipment and materials suppliers include[3]:

- Applied Materials
- ASML
- TOKYO Electron
- LAM Research
- KLA Tencor
- PeroxyChem
- Air Liquide
- Cabot Microelectronics
- Matheson Tri Gas
- Air Products
- Dow
- To1k
- ShinEtsu
- ATMI
- FujiFilm
- Boitec
- Electronic Materials
- JSR Micro

In general, the supply chain business development included 1st tier tools (e.g., Applied Materials, Tokyo Electron, Intel) and specialty chemical producers (e.g., PeroxyChem, Matheson). PeroxyChem located north of Malta in Saratoga Springs, where it built a 7,100 square foot facility in the Grande Industrial Park providing 10 jobs. Some "spec" development did occur, including a few industrial buildings, one of which became home to Aronoff, a logistics and freight forwarding company.

While these supply chain businesses located in the Capital Region, supply chain business development was significantly less than what was originally anticipated. Investors accumulated commercial and industrial spaces in Malta expecting a surge in demand for commercial real estate, which never materialized to any significant extent. The initial speculative investment drove up prices to the point where it deterred some businesses from locating in Malta because there was cheaper flex space in other markets.

Furthermore, GlobalFoundries' suppliers are typically contracted for one to three years, and therefore, do not seek long-term leases. In fact, there is evidence that some service providers prefer even month to month leases. These providers are often teams of engineers requiring a small amount of backroom office space. The industrial warehouse market did not benefit in a meaningful way from the GlobalFoundries development because there is not much heavy equipment shipping activity.

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[2] http://www.joc.com/international-logistics/global-sourcing/globalfoundries%E2%80%99-upstate-ny-plant-requires-world-class-supply-chain_20130820.html

[3] http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_083002.pdf

Beyond the Supply Chain: Economic Impact Analysis

To better understand the spinoff effects, we examined the economic impact that the GlobalFoundries Project had in the Capital Region as an example of what might occur in the Rome/Utica region. The impact analysis shows what spinoff activity there has been in terms of sales, jobs, and earnings – and in what industries these spinoff effects have been felt.

For this analysis, we examine the spinoff (economic impact) as if the GlobalFoundries had been the same size as the proposed Marcy Nanocenter. Therefore, the analysis studies the impact of 1,000 jobs in the semiconductor manufacturing industry on the Capital Region. Some projections have placed the job figure for Marcy higher; however, to be conservative we use the 1,000 jobs figure for this exercise. The geography we use is the four-county Capital Region (Saratoga, Albany, Schenectady, and Rensselaer counties). We use a regional geography because any spinoff impacts of the Marcy project that occur in the Rome/Utica Region have potential to locate in the City of Rome.

As shown in the table below, 1,000 semiconductor manufacturing jobs generated an additional 743 jobs in the region. An additional $35.6 million in earnings (wages), and $93 million in sales was also generated.

Regional Economic Impact of 1,000 Global Foundries Jobs			
	Direct	Indirect	Total
Jobs	1,000	743	1,743
Earnings	$122,828,692	$35,620,321	$158,449,013
Sales	$339,460,722	$93,468,630	$432,929,353

Source: EMSI

The following table shows the breakdown of the industries that the 743 indirect jobs fall into. Note that these industries include those affected directly and indirectly including business-to-business transactions and spending by workers of affected industries. Health Care and Social Assistance; Retail Trade; and Professional, Scientific, and Technical Services are the most impacted industry sectors (2-digit NAICS level).

Regional Job Impact (2-digit NAICS)			
NAICS	Description	Indirect Job Impact	Primary Space Usage
62	Health Care and Social Assistance	132	Medical Office
44	Retail Trade	104	Retail
54	Professional, Scientific, and Technical Services	78	Office
72	Accommodation and Food Services	69	Retail/Other
81	Other Services (except Public Administration)	51	Office
23	Construction	49	Other
56	Administrative and Support and Waste Management and Remediation Services	39	Office
53	Real Estate and Rental and Leasing	32	Office
90	Government	32	Institutional
52	Finance and Insurance	31	Office
61	Educational Services	31	Institutional
42	Wholesale Trade	21	Industrial
31	Manufacturing	19	Industrial
71	Arts, Entertainment, and Recreation	19	Other
51	Information	14	Office
48	Transportation and Warehousing	12	Industrial
55	Management of Companies and Enterprises	6	Office
22	Utilities	2	Other
11	Crop and Animal Production	1	Other
21	Mining, Quarrying, and Oil and Gas Extraction	1	Other
	Total	**743**	

Source: EMSI

The following table provides greater detail by looking at the 3-digit NAICS level. The most impacted industry sub-sectors are listed. Professional, Scientific, and Technical Services; Food Services and Drinking Places; and Ambulatory Health Care Services are the top three impacted industry sub-sectors.

Top Affected Industries in Region (3-digit NAICS)		
NAICS	Description	Indirect Job Impact
541	Professional, Scientific, and Technical Services	78
722	Food Services and Drinking Places	61
621	Ambulatory Health Care Services	49
561	Administrative and Support Services	38
238	Specialty Trade Contractors	33
624	Social Assistance	32
611	Educational Services	31
622	Hospitals	30
903	Local Government	30
531	Real Estate	30
445	Food and Beverage Stores	24
623	Nursing and Residential Care Facilities	21
812	Personal and Laundry Services	21

Source: EMSI

Potential Demand for Commercial Real Estate from Marcy

Office

- There will likely be spinoff activity in the Professional, Scientific, and Technical Services industry. In the example of GlobalFoundries, every 1,000 jobs in the semiconductor manufacturing industry generated nearly 80 new jobs in the professional services category. This industry primarily uses typical office space and 80 jobs would translate into demand for about 20,000 square feet of office space in the region. When all of the office-utilizing industries are considered (excluding medical office), **there may be new regional demand for approximately 75,000 square feet of office space.**
- The Marcy Nanocenter will generate demand for office space, with businesses in the Professional, Scientific, and Technical Services Industry representing the greatest source of demand. The Greater Rome market has 145,000 square feet of office space available for lease or sale; however, approximately 72% of this space is low quality Class C space. This space is unlikely to meet the demands of new professional services businesses. Additionally, the Class B office space that is available in the market is relatively old with the newest building with available space dating to 1984. Therefore, there may be some feasibility for office development/redevelopment in Rome.

Retail and Restaurants

- Restaurants would also see growth as new workers spend a portion of their wages eating out in the local area. The 61 restaurant spinoff jobs equate to approximately **18,300 square feet of restaurant space**. Put another way, that would be about **4 to 5 new restaurants** based on the average number of employees per establishment.
- Retail trade would also be impacted with 104 new jobs in the region. That means new demand for approximately **62,000 square feet of retail space** (the equivalent of about 7 new retail businesses based on Oneida County averages).
- As new workers move into the area, they will attract new retail businesses to the area. The Greater Rome market has 22 properties, representing 36 individual spaces available for lease or sale. These spaces amount to nearly 200,000 square feet of available retail space. While much of this space is dated (only three buildings with available space were built in 2000 or later), the volume of available space on the market is likely to deter any new retail development. The regional demand projection for new retail space is 62,000 square feet. Rome and Utica combined are likely to have enough retail vacancy to absorb much of this demand.

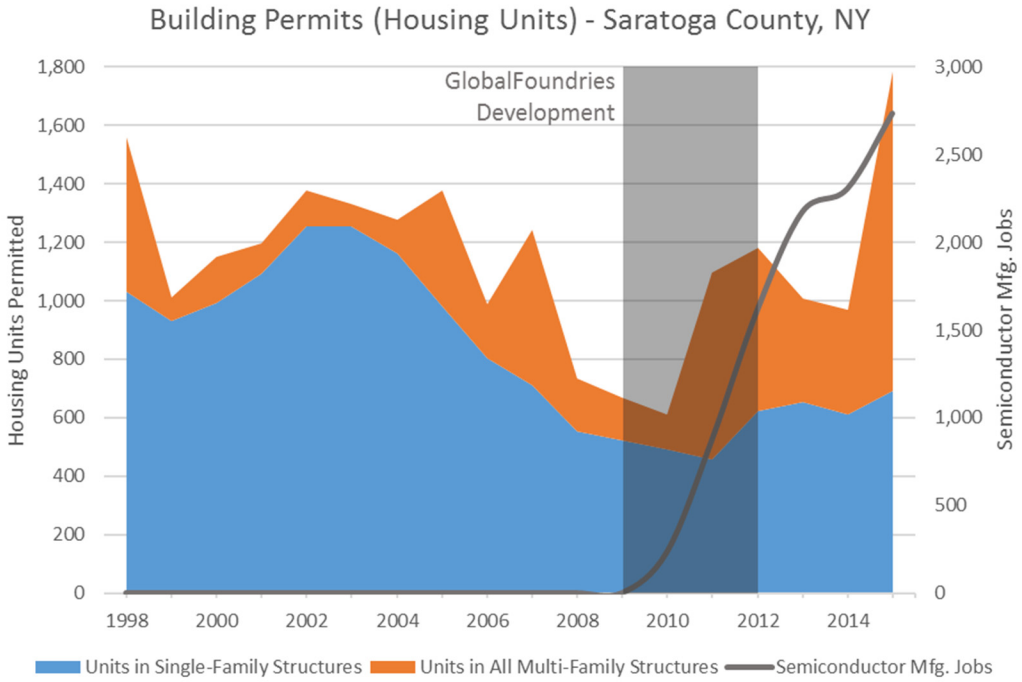
Industrial

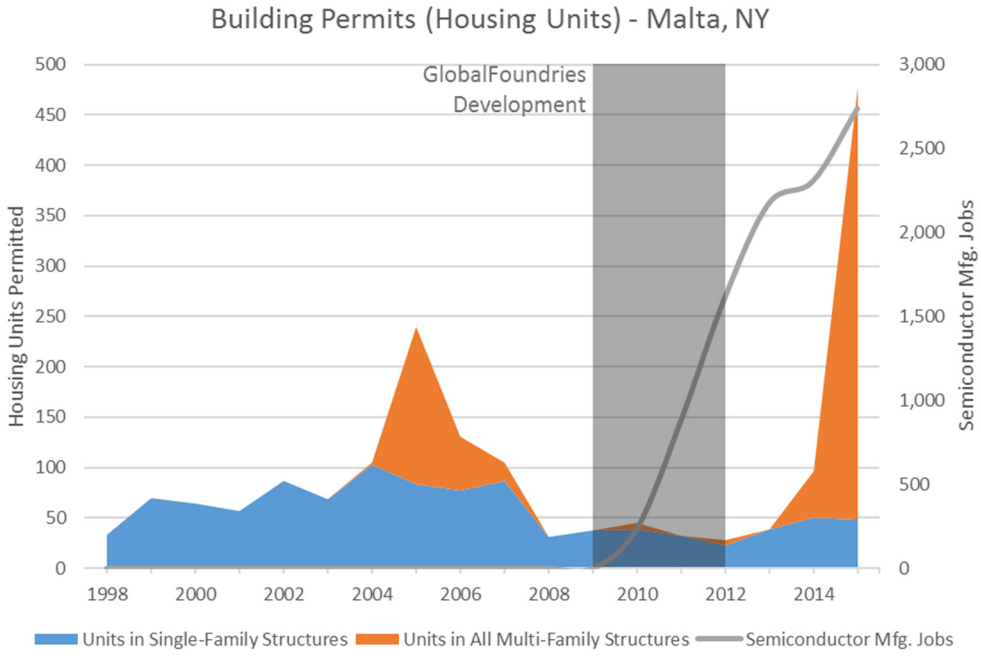
- Industries that use industrial space such as warehouses, flex-space, and manufacturing space will be impacted less than the "service" categories. Wholesale Trade would gain 21 jobs; Manufacturing would gain 19; and Transportation and Warehousing would add 12 jobs. These job impacts translate roughly into new demand for about 21,000 square feet for Wholesale Trade; 9,500 square feet for Manufacturing; and 12,000 square feet for transportation and warehousing. That would likely mean about **33,000 square feet of warehousing/storage space and 9,500 square feet of flex industrial space.**
- Rome's Griffiss Business and Technology Park is well-positioned to absorb some of the supply chain businesses that would be expected to locate in the region. Several high-tech R&D businesses are located in the park and the park has a Technology Heights district, which is a cluster of high tech office, research, and development buildings. According to the park's website, there is a total of about 400 acres of land available plus nearly 340,000 square feet of facility space; however, no space is listed as available in the Technology Heights district.

- In general, industrial land is more expensive in the Rome market and industrial users are more likely to locate in other surrounding markets that have cheaper land and easy access to the NYS Thruway.
- The GlobalFoundries case study indicates that there may not be a substantial demand for industrial space generated as a result of the Marcy Nanocenter project. Supply chain businesses generally included companies looking for a small amount of office space on a short-term basis and some specialty gas producers that generally preferred to locate in very close proximity to the fab plant.

Residential Real Estate Impact

GlobalFoundries had a significant impact on the local housing market in both Saratoga County and the Town of Malta. The project led to a significant building boom of high-end and luxury residential apartments. Workers at GlobalFoundries have had a much stronger preference for rental units rather than single-family homes. The following charts show the correlation between housing permits and the GlobalFoundries development in the county and town.





In Saratoga County, the annual number of multi-family housing units permitted was about 600 from 2011 through 2015 compared to an annual average of 230 from 1998 through 2007. In Malta, the change was similar with the Town permitting an average of 23 multi-family housing units annually from 1998 through 2007 compared to an annual average of 81 from 2011 through 2015. Some of this growth may be attributed to the recovery from the recession and shifting housing preferences; however, developers of new apartment complexes have specifically targeted the GlobalFoundries workforce and there is no doubt that the GlobalFoundries development has been the primary driver of the apartment building boom in the area.

The following are some of the major residential projects that GlobalFoundries has spurred and that are specifically targeted to workers at the plant.

The Lofts at Saratoga BLVD

Hayes Development Co is developing the $30 million, 214-unit loft-style apartment complex and clubhouse in Malta, NY. The development will include one- and two-bedroom apartments ranging from 975 square feet to 1,340 square feet. Rents for the luxury apartments range from $1,200 to $1,900+ per month. GlobalFoundries workers are the primary target market. The development has continually had a waiting list of pre-approved tenants waiting to move in.

Ellsworth Commons

The Ellsworth Commons were built in downtown Malta featuring luxury apartments and on-site amenities such as shops and eateries. The mixed-use project was a $60 million development with 70,000 square feet of ground floor commercial space and 312 apartments above. Many of the tenants work at the GlobalFoundries plant and the residential units were quick to be filled. The commercial space was much slower to be absorbed by the market. After four years, only 37 percent was leased. Rents for the apartments range from $980 to over $1,580 per month while commercial lease rates are $16 per square foot.

GrandeVille at Park Place

Grandeville at Park Place is currently under construction in Malta and is targeted specifically to GlobalFoundries staff. The project will feature 511 apartments over 42 acres. The first phase of the project, a $40 million investment, will total 292 one-, two-, and three-bedroom apartments. Units will be spread over three-story buildings, six townhouses, and five carriage-house structures. Rents are expected to range from $1,300 to $2,200 per month.

Attachment A: What is economic impact analysis?

The purpose of conducting an economic impact study is to ascertain the total cumulative changes in employment, earnings and output in a given economy due to some initial "change in final demand". To understand the meaning of "change in final demand", consider the installation of a new widget manufacturer in Anytown, USA. The widget manufacturer sells $1 million worth of its widgets per year exclusively to consumers in Canada. Therefore, the annual change in final demand in the United States is $1 million because dollars are flowing in from outside the United States and are therefore "new" dollars in the economy.

This change in final demand translates into the first round of buying and selling that occurs in an economy. For example, the widget manufacturer must buy its inputs of production (electricity, steel, etc.), must lease or purchase property and pay its workers. This first round is commonly referred to as the "Direct Effects" of the change in final demand and is the basis of additional rounds of buying and selling described below.

To continue this example, the widget manufacturer's vendors (the supplier of electricity and the supplier of steel) will enjoy additional output (i.e. sales) that will sustain their businesses and cause them to make additional purchases in the economy. The steel producer will need more pig iron and the electric company will purchase additional power from generation entities. In this second round, some of those additional purchases will be made in the US economy and some will "leak out". What remains will cause a third round (with leakage) and a fourth (and so on) in ever-diminishing rounds of industry-to-industry purchases. Finally, the widget manufacturer has employees who will naturally spend their wages. Again, those wages spent will either be for local goods and services or will "leak" out of the economy. The purchases of local goods and services will then stimulate other local economic activity. Together, these effects are referred to as the "Indirect Effects" of the change in final demand.

Therefore, the total economic impact resulting from the new widget manufacturer is the initial $1 million of new money (i.e. Direct Effects) flowing in the US economy, plus the Indirect Effects. The ratio of Total Effects to Direct Effects is called the "multiplier effect" and is often reported as a dollar-of-impact per dollar-of-change. Therefore, a multiplier of 2.4 means that for every dollar ($1) of change in final demand, an additional $1.40 of indirect economic activity occurs for a total of $2.40.

Key information for the reader to retain is that this type of analysis requires rigorous and careful consideration of the geography selected (i.e. how the "local economy" is defined) and the implications of the geography on the computation of the change in final demand. If this analysis wanted to consider the impact of the widget manufacturer on the entire North American continent, it would have to conclude that the change in final demand is zero and therefore the economic impact is zero. This is because the $1 million of widgets being purchased by Canadians is not causing total North American demand to increase by $1 million. Presumably, those Canadian purchasers will have $1 million less to spend on other items and the effects of additional widget production will be cancelled out by a commensurate reduction in the purchases of other goods and services.

Changes in final demand, and therefore Direct Effects, can occur in a number of circumstances. The above example is easiest to understand: the effect of a manufacturer producing locally but selling globally. If, however, 100% of domestic demand for a good is being met by foreign suppliers (say, DVD players being imported into the US from Korea and Japan), locating a manufacturer of DVD players in the US will cause a change in final demand because all of those dollars currently leaving the US economy will instead remain. A situation can be envisioned whereby a producer is serving both local and foreign demand, and an impact analysis would have to be careful in calculating how many "new" dollars the producer would be causing to occur domestically.

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