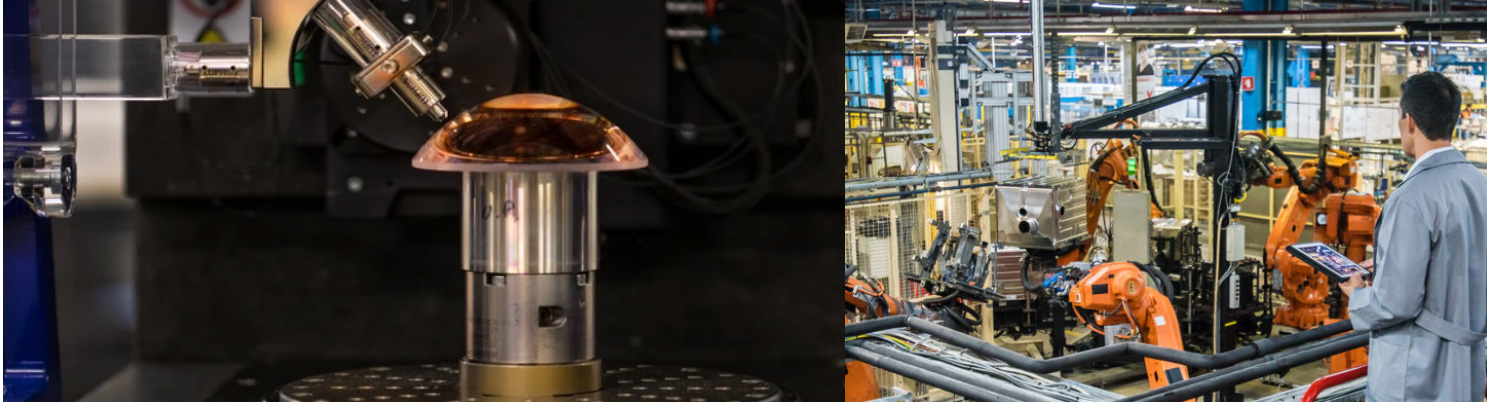




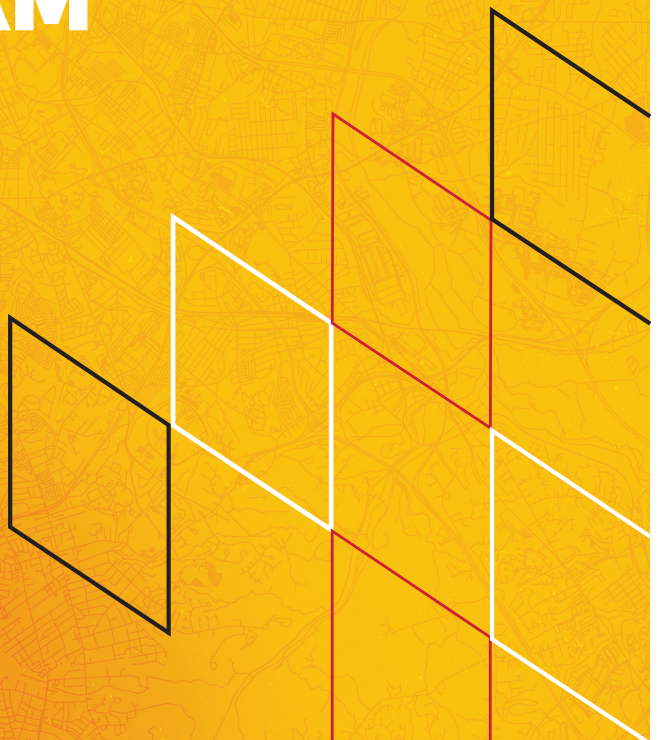
FY2025-FY2026 ECONOMIC IMPACT REPORT



MARYLAND MANUFACTURING 4.0 GRANT PROGRAM



**Modernizing Maryland
manufacturing through
technology, investment and
workforce growth**



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Maryland Department of Commerce, Office of Manufacturing

August 2026

Project Acknowledgment

Rustam Biswas, Governor's Summer Intern with the Maryland Department of Commerce, Office of Manufacturing, served as the lead intern researcher for this project. He conducted grantee outreach and interviews, compiled and analyzed program data, and performed the underlying research and economic analysis supporting this impact report. His work provided the foundation for evaluating the FY2025 and FY2026 outcomes of the Maryland Manufacturing 4.0 Grant Program.

Impact at a Glance

The Manufacturing 4.0 Grant Program (M4.0) provides last-mile matching capital to small and medium-sized manufacturers investing in robotics, automated production systems, software, data infrastructure and other Industry 4.0 technologies. The FY2025-FY2026 analysis combines survey data and qualitative interviews of 65 grantee companies.

65 companies surveyed / interviewed	\$17.44M combined state + private project expenditure, inflation-adjusted	1.51x overall private-investment leverage	88 reported jobs created
8.63% FY2025 average reported wage growth	7.03% FY2026 average reported wage growth	\$48.34M reported export volume	2.25-2.96 years estimated investment recovery period

Bottom line

Across the two award cohorts, M4.0 grant funding helped manufacturers accelerate with major modernization projects, leverage additional private capital, add jobs, increase wages, expand production capacity and generate modeled fiscal returns to Maryland.

Private Investment by the M4.0 Grant Program

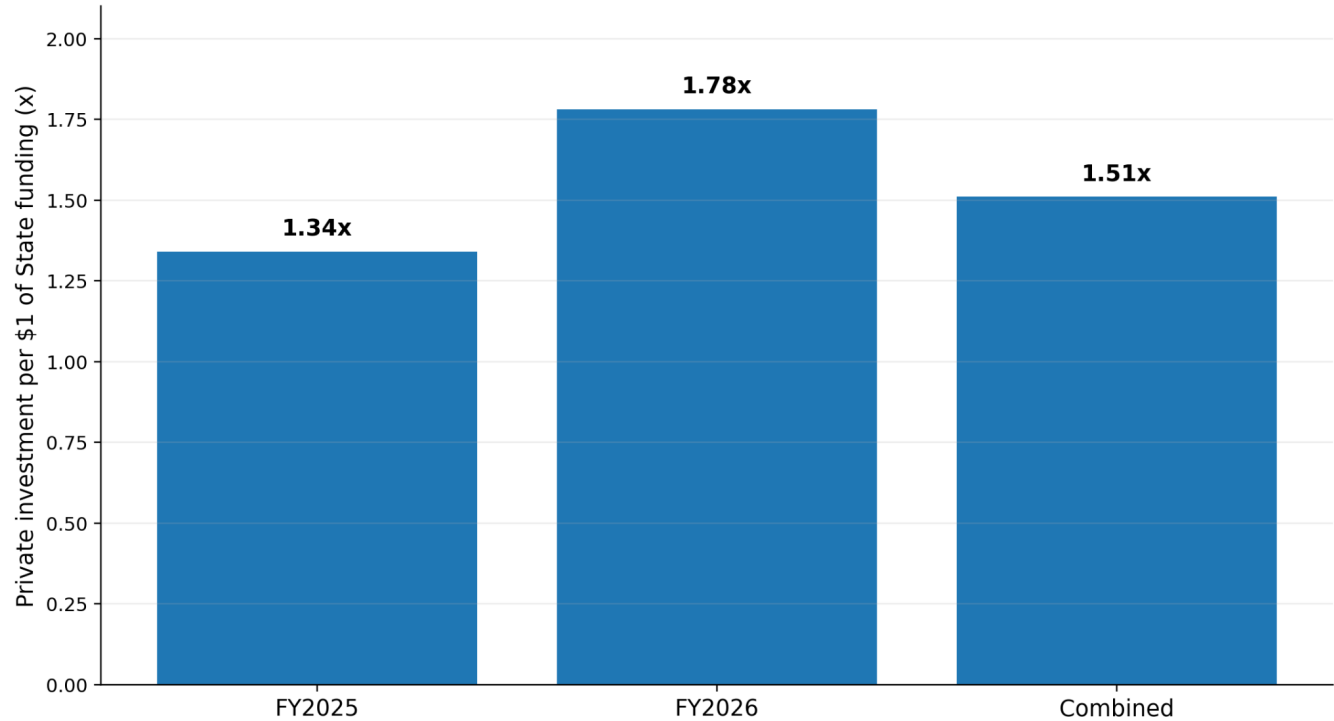


Figure 1. Private-investment leverage reported for FY2025, FY2026 and the combined cohorts.

Executive Summary

The Maryland Manufacturing 4.0 (M4.0) Grant Program provides matching grants to small and medium-sized manufacturers that are adopting advanced production technologies. This report evaluates the FY2025 and FY2026 grant year cohorts using primary survey data, company interviews and validated economic modeling.

1. State funding is leveraging substantial private investment

M4.0 grant awards function as last-mile capital that helps manufacturers complete technology projects that often represent some of the largest capital investments undertaken by the participating companies. The analysis estimates \$6.7 million in private expenditure associated with the FY2025 cohort and \$3.55 million with the FY2026 cohort. The average leverage ratio (private investment for each public dollar spent) was 1.51x, rising from 1.34x in FY2025 to 1.78x in FY2026.

2. Participating manufacturers reported job and wage growth alongside automation

Forty-nine of the 65 projects involved automation or robotic systems. Rather than reporting net workforce contraction, participating companies reported 88 jobs created across the two cohorts. FY2025 companies reported an average year-over-year wage increase of 8.63%, while FY2026 companies reported an average increase of 7.03%, even though many FY2026 projects had not yet reached full implementation.

3. The program supports productivity, reshoring and market expansion

Company interviews show that grant-funded technologies are reducing production bottlenecks, improving quality, shortening lead times, moving outsourced work in-house and enabling businesses to compete for larger or more sophisticated customers. Surveyed companies reported \$48.34 million in export volume across the two cohorts.

4. The validated economic analysis indicates a strong fiscal return

For surveyed respondents included in the tax analysis, the estimated recovery period (ROI for state investment) for grant expenditures was approximately 2.96 years for FY2025 and 2.25 years for FY2026. Benefit-cost ratios were modeled above 20 for the surveyed investment base. The Gompertz model identifies approximately \$9.4 million in annual funding as the current maximum-yield level under the model assumptions.

How to read the technical analysis

The main report focuses on program outcomes and policy implications. Detailed tax assumptions, elasticity calculations, linear and logarithmic projections, GVA (Gross Value Added) scenarios and the Gompertz model are retained in the Technical Appendix.

About the Program and Methodology

Program purpose

The Manufacturing 4.0 Grant Program¹ provides matching capital to Maryland manufacturers investing in technologies that improve production capability, data visibility, automation, quality, workforce productivity and competitiveness. For many participating businesses, the award serves as the final source of capital needed to move a modernization project from planning to implementation.

Impact measures

- Private investment and manufacturing modernization
- Supply chain reach and market expansion
- Workforce growth and wage outcomes
- Productivity and national/global competitiveness
- Estimated fiscal return on state investment
- Contribution to manufacturing output and state revenues

Survey and interview process

During June and July 2026, surveys and follow-up interviews were conducted with 65 grantee companies: 43 FY2025 awardees and 22 FY2026 awardees. The survey combined quantitative and qualitative questions designed to assess the financial and operational impacts of the grant-funded projects.

Companies reported information on project equipment and software, sourcing and sales regions, headcount, wage changes, machine utilization, input and output volumes, current and prior costs, sales, income, quality, production speed, artificial-intelligence integration, advanced technology adoption and market expansion. Survey data were refined through follow-up interviews.

Important reporting note

Not every company answered every quantitative question. Where response rates differ, the report identifies the surveyed or responding subset rather than implying that each measure applies uniformly to all 65 companies.

¹ <https://commerce.maryland.gov/fund/maryland-manufacturing-4-0>

FINDING 1

Private Investment and Manufacturing Modernization

The program has a statutory annual funding floor of \$1 million. Funding increased to \$5 million in FY2025 before declining to \$2 million in FY2026. Despite the lower FY2026 appropriation, participating manufacturers continued to commit significant private capital to modernization projects.

The analysis estimates \$3.55 million in private expenditure associated with \$2 million in FY2026 state funding and \$6.7 million in private expenditure associated with \$5 million in FY2025 state funding. After inflation adjustment, the report estimates \$17.44 million in combined state and private project expenditure across the two cohorts. Companies also reported additional capital spending outside the grant project of approximately \$555,050 in FY2025 and \$722,142 in FY2026.

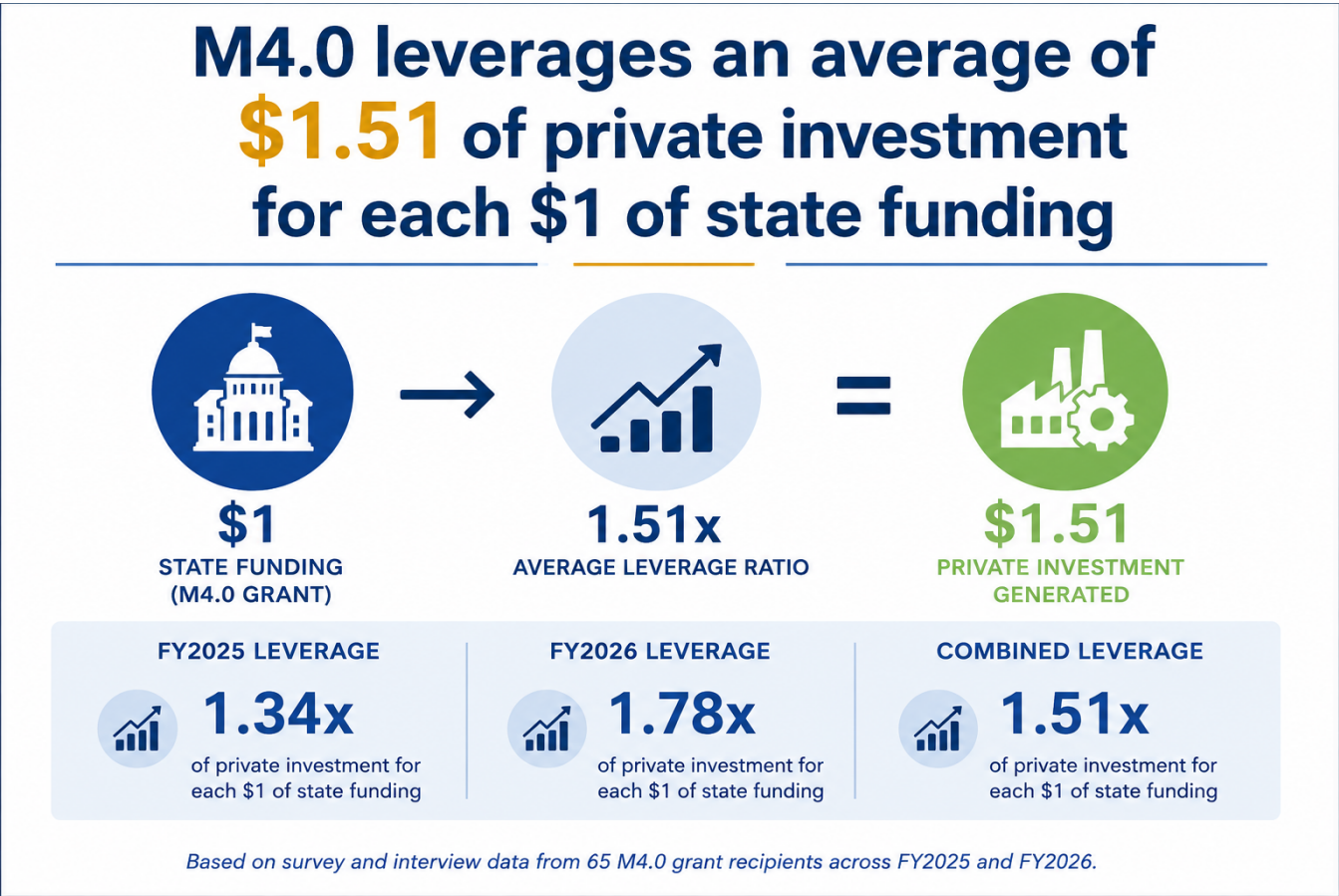


Figure 2. Private investment leveraged for each \$1 of state funding.

What leverage means

A 1.78x leverage ratio means that approximately \$1.78 in private investment was associated with each \$1 of state grant funding in FY2026. The validated model also considers how leverage may change as the program expands and as company cash-flow requirements increase.

Representative technology investments

Company	Upgrade	Award year	Source
American Wood Fibers Inc.	H&H 330E Bulk Bagger	FY2026	USA
Intralix, Inc.	BioFlow Fermenter and Supermicro GPU server	FY2026	Germany / USA
Thorlabs Quantum Electronics, Inc.	Dell PowerEdge XE8640 server with NVIDIA GPUs	FY2026	USA
Patriot Steel Fabrication, Inc.	Radley Material Traceability Platform	FY2026	USA
J. G. Edelen Co. Inc.	TruArc Weld 1000	FY2025	Germany
Columbia Biosciences Corp.	Custom automated chromatography monitor	FY2025	USA
Hardwire, LLC	Fanuc R2000 series robot	FY2025	Japan

Among the equipment purchases reported in the analysis, 58% were sourced from the United States, followed by Japan (13%), Germany (10%), Switzerland (6%), and China, Italy, Malaysia and Norway (3% each). The sourcing pattern demonstrates participating manufacturers' access to specialized automation and production technologies from both domestic and international suppliers.

FINDING 2

Workforce Growth and Wage Outcomes

Automation is often associated with concerns about worker displacement. The analysis compares the M4.0 grant outcomes with a national automation benchmark from Acemoglu and Restrepo (2020)². Approximately 49 of the 65 M4.0 grant projects were identified as automation or robotic systems: 31 in FY2025 and 18 in FY2026.

The reported M4.0 grant outcomes differed substantially from the displacement effects described in the cited national study. Responding grantees reported 88 jobs created as a result of the modernization projects. Job growth occurred not only in production roles but also in engineering, accounting, quality control and other supporting functions.

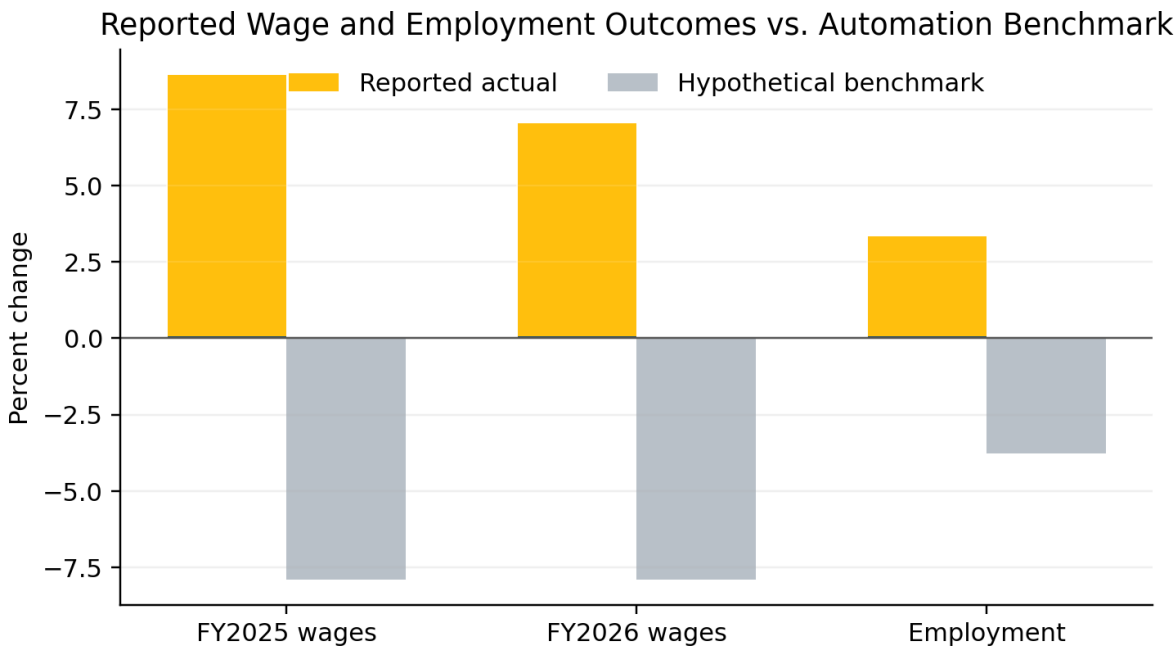


Figure 3. Reported wage and employment M4.0 outcomes compared with the hypothetical automation benchmark predicted by Acemoglu and Restrepo methodology. .

FY2025 companies reported an average year-over-year wage increase of 8.63%. FY2026 companies reported an average wage increase of 7.03%, despite the fact that many FY2026 projects had not yet reached full implementation. The wage figures are averages of company-reported average wage changes and are not weighted by company payroll or wage level.

What this means

For the companies studied, technology adoption was associated with expanded capacity and changing job content rather than broad workforce contraction. Interviews also indicate increased demand for engineering, quality, technical oversight and digital-management capabilities. The Maryland Manufacturing 4.0 program outperformed the Acemoglu and Restrepo model.

² Acemoglu, D. and Restrepo, P. (2020), Robots and Jobs: Evidence from U.S. Labor Markets. Source URL in original report: <https://shapingwork.mit.edu/wp-content/uploads/2023/10/Robots-and-Jobs-Evidence-from-US-Labor-Markets.p.pdf>

Supply Chain Reach and Competitiveness

Global sourcing and material inflow

Maryland manufacturers in the surveyed cohorts rely on diversified supply chains for specialized materials and production inputs. Companies reported approximately \$22.17 million in international sourcing volume: about \$3.9 million for FY2025 companies and more than \$18.2 million for FY2026 companies. Reported sourcing regions included Asia, Europe, Canada and Latin America, in addition to Maryland and the broader Mid-Atlantic and Northeast.

Exports and market expansion

Surveyed manufacturers reported \$48.34 million in export volume across the two cohorts. Destination markets included Canada, Europe, Asia and Latin America, along with customers throughout the United States. Company interviews also documented the importance of the Port of Baltimore and regional logistics networks to manufacturers with bi-directional global supply chains. M4 Grants leveraged more than a 2x export versus import activities.

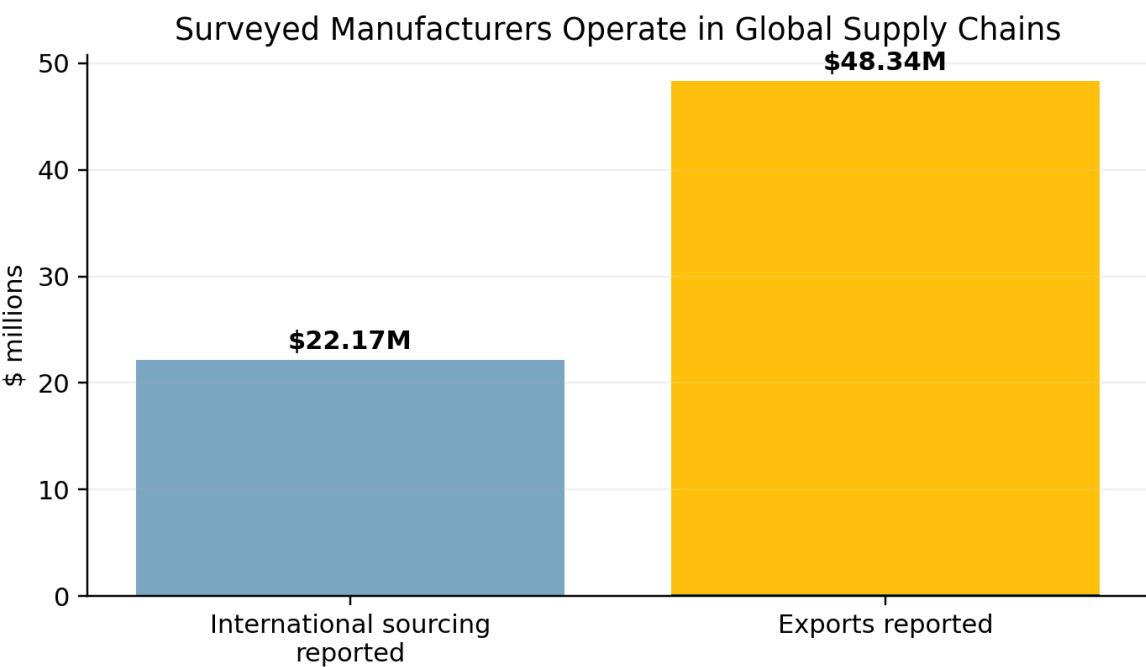


Figure 4. Reported international sourcing and export volumes across surveyed cohorts.

Competitive position

The analysis places these company-level outcomes in the context of Maryland's broader trade position. It reports a Maryland export-to-import ratio of 0.37 compared with a national average of 0.85. For manufacturers interviewed for this report, technology investment was repeatedly described as necessary to compete with overseas production, improve domestic cost and quality performance, and bring selected production activities back in-house or back to the United States. The last mile grant allowed companies to produce more materials within the state rather than purchasing materials from overseas.

Manufacturer perspective

One repeat awardee summarized the competitive challenge this way: the company views automation as essential to competing globally and is pursuing a long-term strategy to bring a portion of production back to the United States from Asia.

FINDING 5

Estimated Fiscal Impact

The validated fiscal analysis estimates for labor-related tax effects can be found in the appendix associated with company employment and wage changes. The model includes state income tax, local income tax, labor-spending tax and the modeled federal contribution described in the source methodology. These calculations of these figures can be found in the appendix.

Cohort	Response	Labor spending tax	State income tax	Local income tax	Federal contribution	Total
FY2025	42%	\$122,961	\$183,178	\$121,072	\$128,609	\$555,822
FY2026	68%	\$98,858	\$160,180	\$107,079	\$128,551	\$494,669.77

For the surveyed respondents included in this calculation, FY2025 grant value of respondents was \$1,644,261 and associated with \$555,822 in modeled labor-related taxes, and FY2026 grant value of \$1,112,217 was associated with \$494,669.77. Under the validated assumptions, this corresponds to an estimated investment ROI on the State of Maryland investment of approximately 2.96 years for FY2025 and 2.25 years for FY2026.

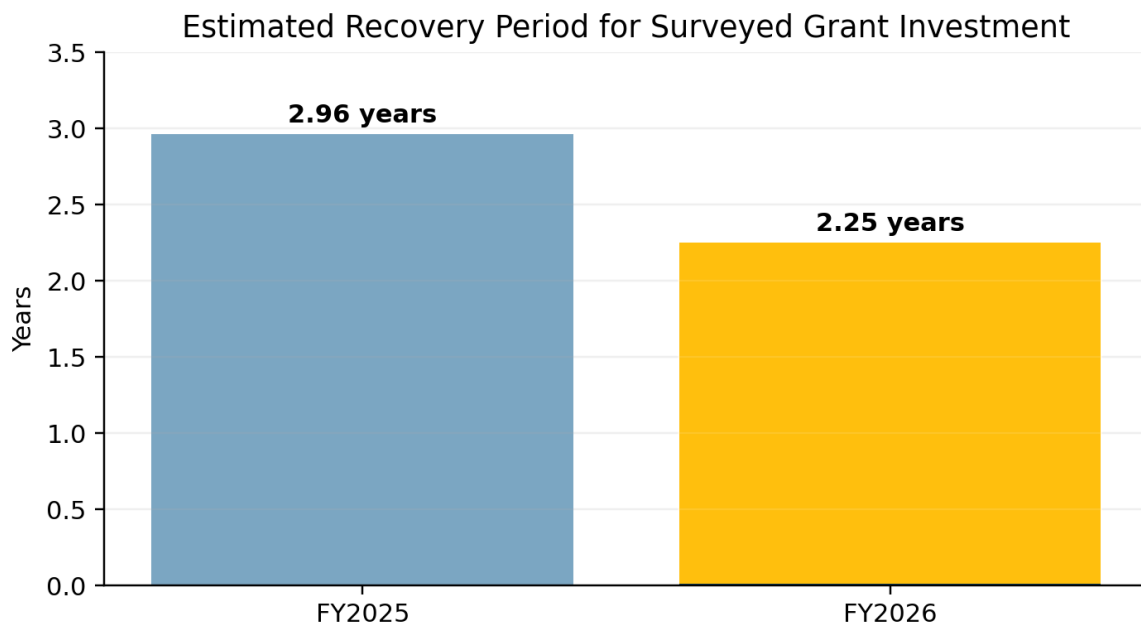


Figure 5. Estimated recovery period for the surveyed grant investment through labor-related taxes.

What this means

The fiscal analysis indicates a relatively short modeled recovery period for the surveyed investment base. Detailed present-value assumptions and tax-model notes are provided in the Technical Appendix.

Manufacturing growth and state revenue

The analysis also compares changes in state revenue with changes in statewide GDP, manufacturing GDP and M4.0 grant-related labor-tax activity. It estimates statewide tax-to-GDP elasticity at 0.85 and tax-to-manufacturing-GDP elasticity at 2.72. For FY2025 M4.0 grantees, the modeled M4.0 grant-to-manufacturing elasticity was 23.94, with the M4.0 grant-to-state measure 8.8 times the manufacturing-sector elasticity. The technical calculations are retained in the appendix.

Manufacturer Outcomes

The quantitative findings are reinforced by company interviews showing how the program affects production on the factory floor. The examples below were selected because they translate the program's economic measures into operational results that are easy to observe and understand.

J. G. Edelen Company, Inc.

Challenge: High-mix sheet-metal production required lengthy machine programming and some work was at risk of being performed overseas.

M4.0 investment: Advanced brake-press and welding technology.

Measured / reported result: Automated reconfiguration reduced programming time from about 20 minutes to one minute per panel. The added capacity helped insource a Marriott TownPlace Suites manufacturing project that otherwise would have been offshored to China. Manufacturing payroll in the first six months of 2026 exceeded the prior full-year total, and engineering capacity expanded.

AnTrust LLC

Challenge: Prototype wireless printed circuit boards for spacecraft and defense applications were outsourced circuit boards and were expensive, with long delivery times and expensive to outsource.

M4.0 investment: Advanced laser etching equipment supporting in-house fabrication.

Measured / reported result: Prototype production timelines fell from as much as 10 weeks to a matter of days, while the cost of prototype board lots fell from about \$15,000 to \$2,500. The capability created a new low-volume contract-manufacturing business line and potential export opportunities to Canada and Europe.

JACS Solutions, Inc.

Challenge: Manual firmware flashing and visual inspection limited throughput for smaller domestic customers.

M4.0 investment: Automated vision and production-line equipment.

Measured / reported result: Output efficiency increased from approximately 180 to 300 units per hour, and lead times fell to roughly one to two weeks from a three to four week leadtime..

Manufacturer Outcomes

Holland & Sherry Inc.

Challenge: A growing 40,000-square-foot Maryland operation needed to manage thousands of SKUs (stock keeping unit) and high daily sample volumes.

M4.0 investment: AutoStore warehouse fulfillment system.

Measured / reported result: The automated system improved sample fulfillment speed, created at least three new full-time positions and enabled existing staff to move into more specialized work. The company also reported its best sales month on record.

Modular Components National Inc.

Challenge: A manual plating process was the company's primary manufacturing bottleneck and exposed defense and automotive production to human-error risk.

M4.0 investment: Fully automated plating line.

Measured / reported result: The line improved consistency and eliminated the plating bottleneck. The company absorbed a 20% increase in orders during the first six months of the year without plating delays.

Latin Goodness Foods LLC (Maspanadas)

Challenge: Legacy spreadsheet-based inventory and bill-of-material tracking created order errors and emergency purchasing as the company grew.

M4.0 investment: Enterprise Resource Planning system, software and hardware.

Measured / reported result: The system created real-time supply-chain visibility and reduced order errors and emergency purchases. Growth supported a third shift for co-packing, a headcount of 56 employees recognizing an additional 42 employees and launches with major national retailers.

Columbia Biosciences Corp.

Challenge: Manual sampling during protein purification constrained laboratory time and process monitoring.

M4.0 investment: Custom automated production and monitoring system with inline dilution and continuous spectral monitoring.

Measured / reported result: The system reduced manual sampling, freed technical staff for higher-value R&D and supported a projected 25% to 30% year-over-year revenue growth rate.

Manufacturer Outcomes

Colonial Metals Inc.

Challenge: A precious-metal chemical manufacturing process required stronger facility instrumentation and better visibility into complex, multi-day reactions.

M4.0 investment: Control-logic architecture and digital instrumentation.

Measured / reported result: The system improved fault detection and production awareness, supported staff upskilling, reduced reliance on outside subcontractors and strengthened quality assurance for regulated pharmaceutical and technology customers.

Patriot Steel Fabrication, Inc.

Challenge: Manual shop-floor progress entry limited time-tracking accuracy and made quoting more difficult amid rising demand for data-center platforms.

M4.0 investment: Barcoding and data-tracking system.

Measured / reported result: Automated data capture improved fabrication-time visibility, bidding accuracy and shop-floor efficiency while supporting two-shift operations in a tight labor market.

Foldfactory.com, Corp. / Fresh Cut Crafts

Challenge: A price-sensitive market and unreliable entry-level equipment constrained throughput and waste performance.

M4.0 investment: Industrial-grade rotary die cutter.

Measured / reported result: Production throughput doubled and the physical waste stream was reduced to approximately one trash bag per week, helping the company absorb higher raw-material costs while sustaining a projected 30% growth rate.

Fabricated Extrusion Company of Maryland, LLC

Challenge: Production errors and dimensional variation created rework and limited the company's ability to meet stringent customer quality requirements.

M4.0 investment: 360-degree inline profile-measurement system.

Measured / reported result: The company estimated a 5% to 10% improvement in production quality and expects the enhanced quality-control capability to support pursuit of larger customers.

Thorlabs Quantum Electronics, Inc.

Challenge: A semiconductor wafer operation needed immediate manufacturing investments to improve cost efficiency and buffer rising material and tariff costs.

M4.0 investment: High-performance computing and production modernization investments.

Measured / reported result: The grant helped prioritize upgrades supporting the company's historical 10% year-over-year growth rate without relying on corporate debt. Company leadership also noted that larger semiconductor equipment investments may require larger grants or complementary capital tools.

Future Funding Scenarios

The source analysis tests how fiscal and manufacturing benefits could change as annual program funding expands. The main report summarizes the results; the full equations and projection tables are retained in the Technical Appendix.

Benefit-cost ratios

Among respondents captured in the validated present-value model, FY2025 projects produced an estimated present value of \$35.18 million against \$1.64 million in surveyed State of Maryland investments, producing a benefit-cost ratio (BCR) of 21.4. FY2026 projects produced an estimated present value of \$31.31 million against \$1.11 million in surveyed investment, producing a BCR of 28.15. Under the model's hypothetical assumption that IF the State financed 100% of the project cost, the adjusted BCRs remain 9.15 and 9.48, (BRC indicates if a public project is worth its price tag. A BCR above 1.0 means the state gets back more money or value than it spends. A BCR below 1.0 means the project costs more than it gives back.)

Gross Value Added at a \$10 million budget

Using the source analysis's 2.81 manufacturing multiplier and assumed leakage outside Maryland, a \$10 million grant budget is projected to generate approximately \$17.24 million to \$20.86 million in Gross Value Added under 40% to 60% leakage scenarios. The zero-leakage scenario produces a modeled \$28.10 million.

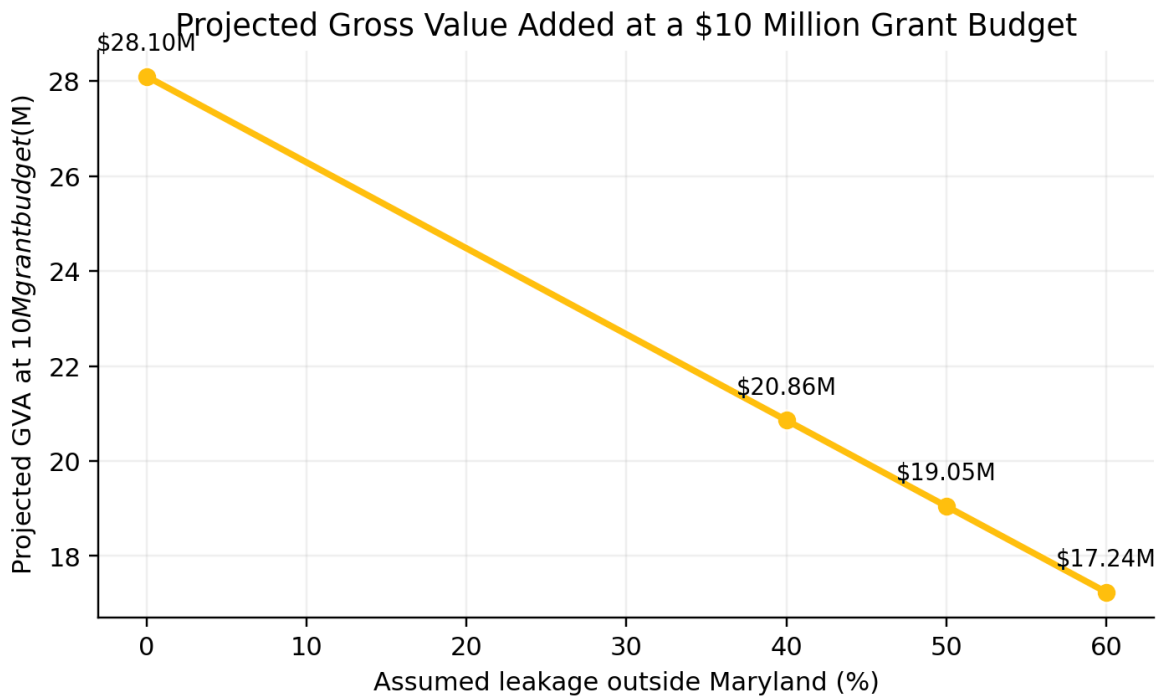


Figure 6. Projected Gross Value Added (defined as the additional economic value generated in Maryland as a result of the manufacturing activity supported by the program) at a \$10 million M4.0 grant budget under alternative leakage assumptions.

Modeled maximum-yield funding level

To determine the most efficient amount of future M4.0 grant funding to maximize cost-benefit ratio to the state of Maryland, we used the Gompertz model. The model estimates a theoretical net-benefit ceiling of approximately \$124.74 million in present-value labor-tax benefits. Under the validated parameters, benefits rise quickly at lower funding levels and then approach a plateau as marginal returns diminish. The model identifies approximately \$9.36 million, rounded to \$9.4 million, as the current maximum-yield annual grant level.³

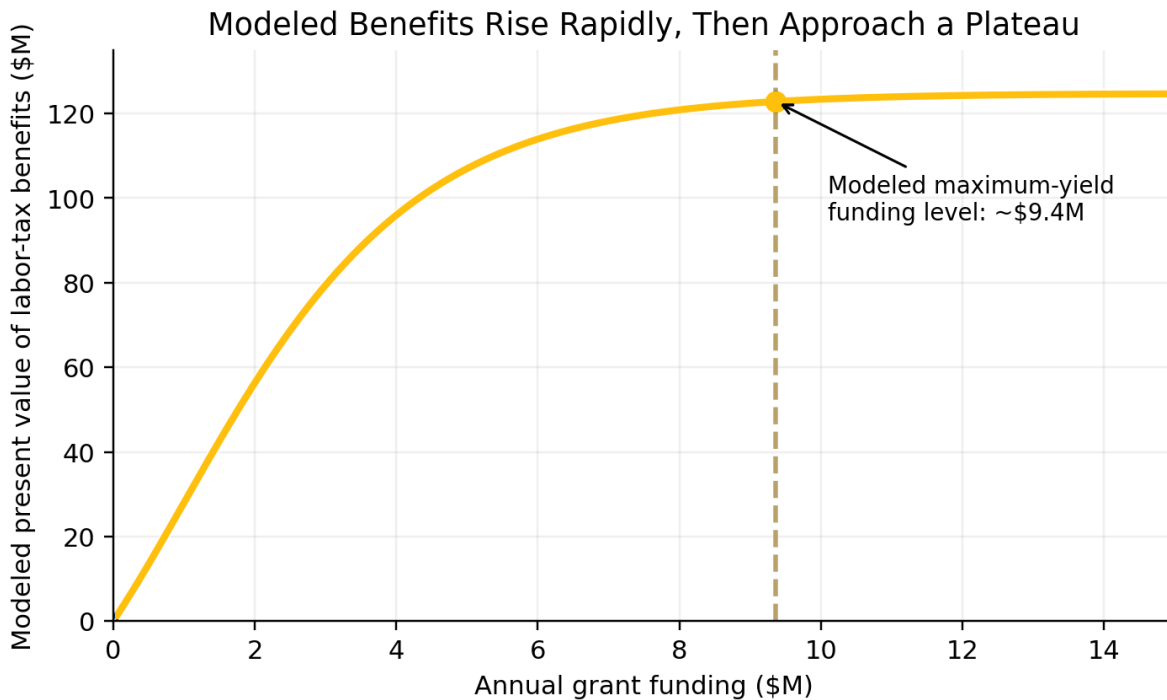


Figure 7. Simplified visualization of the validated Gompertz benefits model and the approximately \$9.4 million maximum-yield M4.0 program funding level.

Conclusion

The \$9.4 million result is a modeled program-funding level based on the current applicant pool, benefit profile and assumptions in the validated analysis. The source report also explores how program design changes could shift the benefits curve and support a larger funding envelope.

³ FY2027 Program Demand: The FY2027 (M427) Manufacturing 4.0 Grant application period closed on August 31, 2026, with 78 applicants requesting more than \$18 million in grant funding for proposed projects representing more than \$36 million in total project investment. Applications are currently under review. These results are not included in the FY2025–FY2026 impact analysis but demonstrate continued demand for advanced manufacturing investment in Maryland.

Implications for Maryland's Manufacturing Ecosystem

Manufacturers

Interviews repeatedly describe the M4.0 grant as last-mile capital that enables small and medium-sized manufacturers to undertake technology investments that would otherwise be difficult to finance. In an advanced manufacturing economy, competitiveness depends not simply on reducing imports but on increasing the value and reach of products sold in domestic and international markets.

Logistics and the Port of Baltimore

Manufacturers with global sourcing and sales footprints depend on regional logistics infrastructure. As M4.0 technologies remove production bottlenecks and raise the volume of finished goods, logistics providers, tracking systems and digital warehousing become increasingly important to the manufacturing value chain.

Prime contractors and federal institutions

Maryland contains a strong base of small and medium-sized suppliers serving federal agencies and major defense contractors. M4.0 investments can help these suppliers increase production capacity, automate assembly and strengthen compliance and quality systems, supporting a more resilient domestic supply chain for specialized components.

Workforce and educational institutions

Industry 4.0 adoption is shifting work toward technical oversight, engineering, digital management and data-driven production. The University System of Maryland and related talent pipelines play an important role in preparing workers to operate robotics, AI-enabled processes and Enterprise Resource Planning systems. The source report also identifies TEDCO, MEDCO and other state economic-development institutions as complementary parts of the advanced-manufacturing ecosystem.

State and local economy

The program contributes to Maryland's broader economic diversification strategy by directing capital to private-sector production capacity, supporting higher-skill employment and strengthening taxable commercial activity. These effects are particularly relevant as Maryland seeks to reduce economic vulnerability and reinforce supply-chain resilience.

Key Findings and Policy Considerations

The FY2025-FY2026 analysis finds that the Manufacturing 4.0 Grant Program is associated with meaningful private investment, manufacturing modernization, workforce growth, wage gains, improved productivity and strong modeled fiscal returns. The analysis also indicates that the program can support Maryland's competitiveness by helping manufacturers bring work in-house, expand exports and improve supply-chain resilience.

Key findings

- **Capital leverage:** State funding is functioning as last-mile capital and is associated with substantial private co-investment.
- **Workforce outcomes:** Participating companies reported 88 jobs created and average wage increases in both award cohorts.
- **Operational impact:** Company interviews document measurable improvements in throughput, lead time, quality, data visibility and cost.
- **Fiscal return:** Analysis estimates the state of Maryland's return on investment in labor taxes in less than 3 years, beating our national average of public investment
- **Funding potential:** Modeling shows that Maryland can maintain ROI (and is effectively leaving tax revenue on the table) and the optimal annual funding predicts 9.4M.
- **Manufacturing's Impact to Maryland's Future Economy:**

Considerations for future program design

1. Consider additional scoring weight for high-performing repeat applicants that demonstrate continued supply-chain or market growth.
2. Consider additional scoring weight for projects with stronger projected employment growth.
3. Continue evaluating applicant cash flow and private co-investment to ensure projects are financially sustainable while maintaining access for smaller manufacturers.
4. Consider the value of Maryland sourcing and sales to customers outside Maryland when evaluating broader state economic impact.
5. Explore appropriate preference or set-aside mechanisms for companies headquartered and primarily operating in Maryland, consistent with program authority and policy objectives.
6. Continue examining leverage expectations for medium-sized enterprises relative to smaller manufacturers as program funding expands.

Policy significance

The analysis shows that advanced technology adoption can support both productivity and workforce growth. That combination is particularly important in the current AI and automation environment, where policymakers are balancing competitiveness, workforce opportunity and the fiscal return on public investment.

Technical Appendix

Project Acknowledgment

Rustam Biswas, Governor's Summer Intern with the Maryland Department of Commerce, Office of Manufacturing, served as the lead intern researcher for this project. He conducted grantee outreach and interviews, compiled and analyzed program data, and performed the underlying research and economic analysis supporting this impact report. His work provided the foundation for evaluating the FY2025 and FY2026 outcomes of the Maryland Manufacturing 4.0 Grant Program.

A. Equipment sourcing summary

Company	Upgrade purchased	Year	Source
American Wood Fibers Inc.	H&H 330E Bulk Bagger	2026	USA
Intralytix, Inc.	BioFlow Fermenter and Supermicro 5UGPU Server	2026	Germany, USA
LS Wholesale LLC	Rocket Machine Works 1292INLX4-6 4-6 Up Filler Sealer	2026	USA
AnTrust LLC	LPKF ProtoLaser H4	2026	Germany
Modha Management Inc.	HSG G3015x 6kW	2026	China
Thorlabs Quantum Electronics, Inc.	Dell PowerEdge XE8640 Server with four NVIDIA RTX Pro 6000 GPUs	2026	USA
Michele's Granola	Mettler Toledo scales; cart lift; pan conveyor; tray feeder; air compressor	2026	USA, Switzerland
Patriot Steel Fabrication, Inc.	Radley Material Traceability Platform	2026	USA
Foldfactory.com, Corp. / Fresh Cut Crafts	Standard Horizon RD-4055 Rotary Die-Cutter	2026	Japan
JACS Solutions Inc.	Robot arm; vision system; conveyor	2026	USA
Amero Foods Manufacturing Corp. (PastryStar)	Microsoft Business Central, Ignition and sensors	2025	USA
Modern Stone Age Family	SMART Dough Sheeter and Commercial Blast Freezer	2025	Switzerland
Hardwire, LLC	Fanuc R2000 series robot	2025	Japan
Parker Vanilla Products, Inc. (Parker Flavors)	Leo Robot and 4-head overflow filler	2025	Italy, USA
Diagnostic Biochips	Keyence VHX-X1	2025	Japan
Hagerstown Kitchens, Inc.	Homag Drill & Dowel / Drillteq D-110/12	2025	USA
Columbia Biosciences Corp.	Chroma-1 custom automated chromatography monitor	2025	USA
Colonial Metals, Inc.	Control Logix 1756 PLC	2025	USA, Malaysia
Hughes Network Systems LLC	PVA FLEXCELL	2025	USA
J. G. Edelen Co. Inc.	TruArc Weld 1000	2025	Germany

B. Fiscal-model notes

The source analysis calculates the present value of labor-related tax inflows using $PV = X / (r - g)$, where X is annual tax revenue, r is the risk-free rate and g is the expected inflation/growth rate. The source report uses a 4.6% risk-free rate and 3% inflation assumption.

- 401(k), HSA and other pre-tax deductions were not separately considered under the source model assumptions.
- Flat deductions of \$23,973 and \$5,019.305 were assumed to reduce adjusted gross income in the source calculation.
- The deduction assumption was not applied to existing employees where the tax effect was treated as marginal.
- Affected employees were adjusted to reflect the vicinity effect attributed to M4.0.
- A 49.83% marriage rate was used in the source model to estimate the expected value of the standard deduction for manufacturing / blue-collar workers.

C. Tax-to-GDP elasticity calculations

The source analysis reports Maryland General Fund revenue of \$25.716 billion in 2025 and \$24.863 billion in 2024, statewide GDP increasing from \$546.03 billion to \$568.14 billion, and manufacturing GDP increasing from \$28.58 billion to \$28.94 billion. From these values, it calculates statewide elasticity of 0.85 and tax-to-manufacturing-GDP elasticity of 2.72.

The source model defines $E_{state} = \% \text{ change in state tax} / \% \text{ change in state GDP}$ and $E_{manufacturing} = \% \text{ change in state tax} / \% \text{ change in manufacturing GDP}$. For FY2025 grantees, it reports $E_{M4.0} = 23.94$ for labor-tax changes and an M4.0 grant-to-state elasticity that is 8.8 times the manufacturing-sector elasticity.

D. Linear and logarithmic tax-revenue projections

Net spend	Adjusted revenue (2.96-year recovery)	Revenue - source actual line	Adjusted revenue (2.25-year recovery)
\$2M	\$604,624.93	\$888,888.89	\$888,888.89
\$5M	\$1,689,189.19	\$1,689,189.19	\$2,483,360.23
\$7M	\$2,412,232.03	\$2,222,722.72	\$3,546,341.12
\$10M	\$3,496,796.29	\$3,023,023.02	\$5,140,812.45

Linear projection assumption: an unlimited hypothetical pool of Maryland SMEs with comparable modernization readiness, project efficiency, completion timelines and disbursement speed, such that diminishing returns are not observed.

Net spend	Adjusted revenue (2.96-year recovery)	Revenue - source actual line	Adjusted revenue (2.25-year recovery)
\$2M	\$604,624.93	\$888,888.89	\$888,888.89
\$5M	\$1,689,189.19	\$1,689,189.19	\$2,483,360.23
\$7M	\$2,087,453.35	\$1,983,068.44	\$3,068,867.99
\$10M	\$2,509,630.38	\$2,294,593.00	\$3,689,531.23

Logarithmic projection assumption: as the sample size increases, grantee performance flattens as risk is diversified across sectors and selection variation, creating diminishing returns.

E. Gross Value Added scenarios

Net spend	0% leakage	40% leakage	50% leakage	60% leakage
\$2M	\$5.62M	\$4.172M	\$3.810M	\$3.448M
\$5M	\$14.05M	\$10.43M	\$9.525M	\$8.620M
\$7M	\$19.67M	\$14.602M	\$13.335M	\$12.068M
\$10M	\$28.10M	\$20.86M	\$19.05M	\$17.24M

The source analysis applies a 2.81 manufacturing multiplier and models external leakage at 40%, 50% and 60%. At a \$10 million budget, it estimates a realistic GVA of approximately \$17.24 million to \$20.86 million under the 40%-60% leakage scenarios.

F. Gompertz model specification

The validated source model uses a Gompertz curve to model total benefits $B(x)$, the benefit-cost ratio and marginal benefits as grant funding increases. The source parameters are $M = \$153.07$ million, baseline shift / sunk equivalent = \$28.33 million, net benefit ceiling = \$124.74 million, $c = 0.523$ and $b = 1.687$ million.

Model definitions: $B(x)$ is the present value of labor-tax benefits; $B'(x)$ is the marginal benefit from an additional unit of investment; M is the theoretical maximum benefit; x is the investment amount; b is the displacement parameter; and c is the decay rate. Under these assumptions, the source report identifies approximately \$9.36 million as the maximum-yield funding level and approximately \$122.82 million in benefits at that point, with a BCR of 13.12.

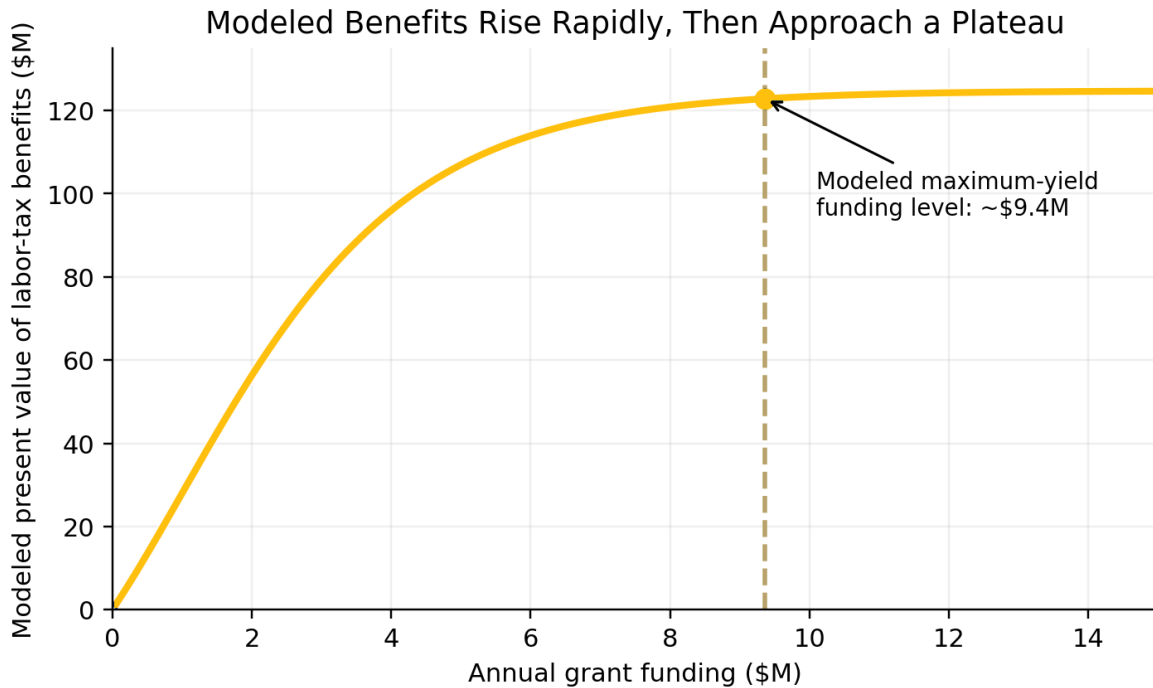


Figure A1. Simplified visualization of the validated Gompertz benefits model.

G. References and Notes:

- Acemoglu, D., & Restrepo, P. (2020). Robots and Jobs: Evidence from US Labor Markets. *Journal of Political Economy*, 128, 2188-2244. <https://shapingwork.mit.edu/wp-content/uploads/2023/10/Robots-and-Jobs-Evidence-from-US-Labor-Markets.p.pdf>
- Original report note on wage calculations: average of company-level average wage increases; not weighted by wage size.
- Original report source used for blue-collar marriage-rate assumption: <https://www.aei.org/op-eds/is-the-collapse-of-blue-collar-marriage-a-foregone-conclusion/>
- Original report source used for manufacturing education / workforce assumption: <https://www.goodwin.edu/enews/how-to-get-into-manufacturing-guide/>
- NAM 2.81 manufacturing multiplier as cited in the original report: <https://nam.org/mfgdata/facts-about-manufacturing-expanded/>