

# Quality-Adjusted Prices for High Tech Goods/Services: Current Work and Future Plans



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# BEA's Digital Economy Initiative

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- BEA is studying new data sources to improve the way we measure digital goods and services in the National Accounts
- Price indexes are an important piece of that
- For the 2018 Comprehensive Update, focusing on three areas:
  - Custom & own-account software
  - Electro-medical equipment
  - Cell phones

# Custom & Own-Account Software

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- Currently use input-cost based price index and PPI for packaged software
  - Input-cost uses domestic wages for software developers
- Goal of our ongoing research some combination of:
  - Output price index based on function points
  - Other analysis to inform our current method (e.g. a productivity adjustment)

# Why (or Why Not) Function Points?

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“**Function points** are used to compute a functional size measurement (FSM) of software.”  
(Wikipedia)

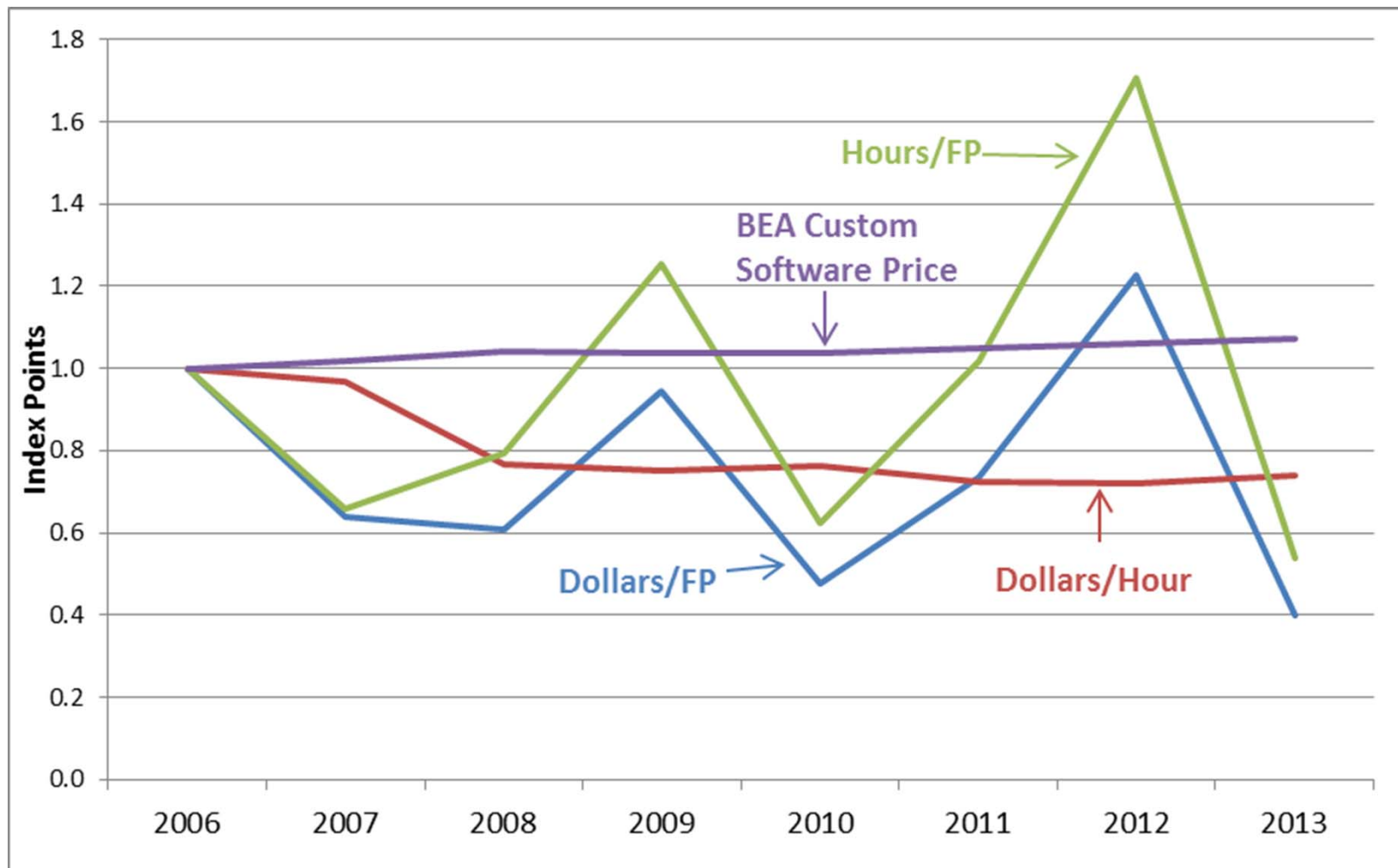
## Pros

- Generally accepted metric in the industry
- The *only* metric that we’ve been able to identify

## Cons

- Not necessarily homogenous
- More not necessarily better
- FP databases are not representative samples

# Function Points Database



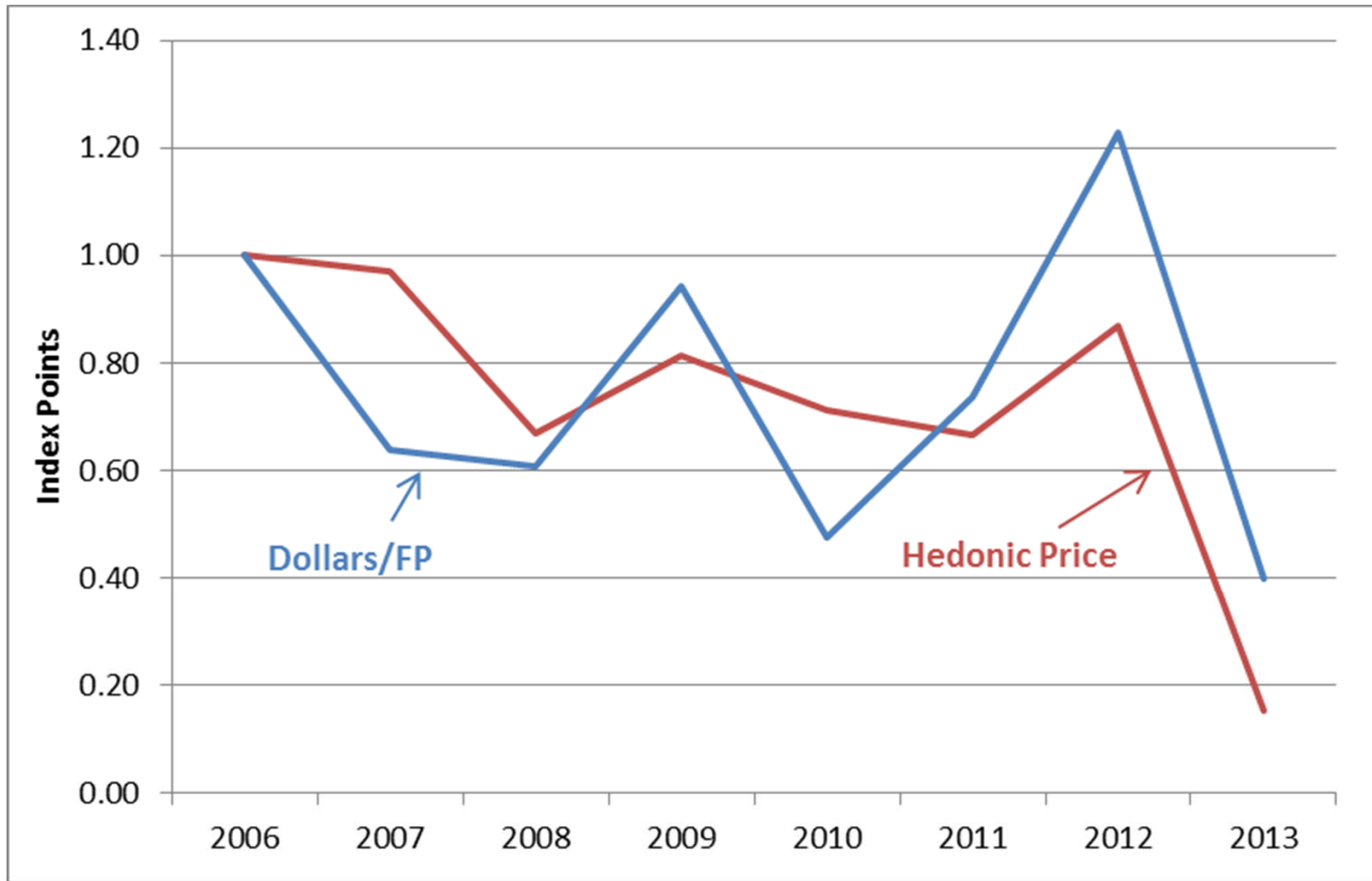
# Justification for Use of Hedonics

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- Heterogeneity in P/FP across projects suggests FPs depend on a lot of things
- Use hedonic regression to control for some of these factors:
  - Client & Client Industry
  - Project Type & Size
  - Maturity of Firm
  - Others.....

# Software Price Indexes



# Medical Equipment

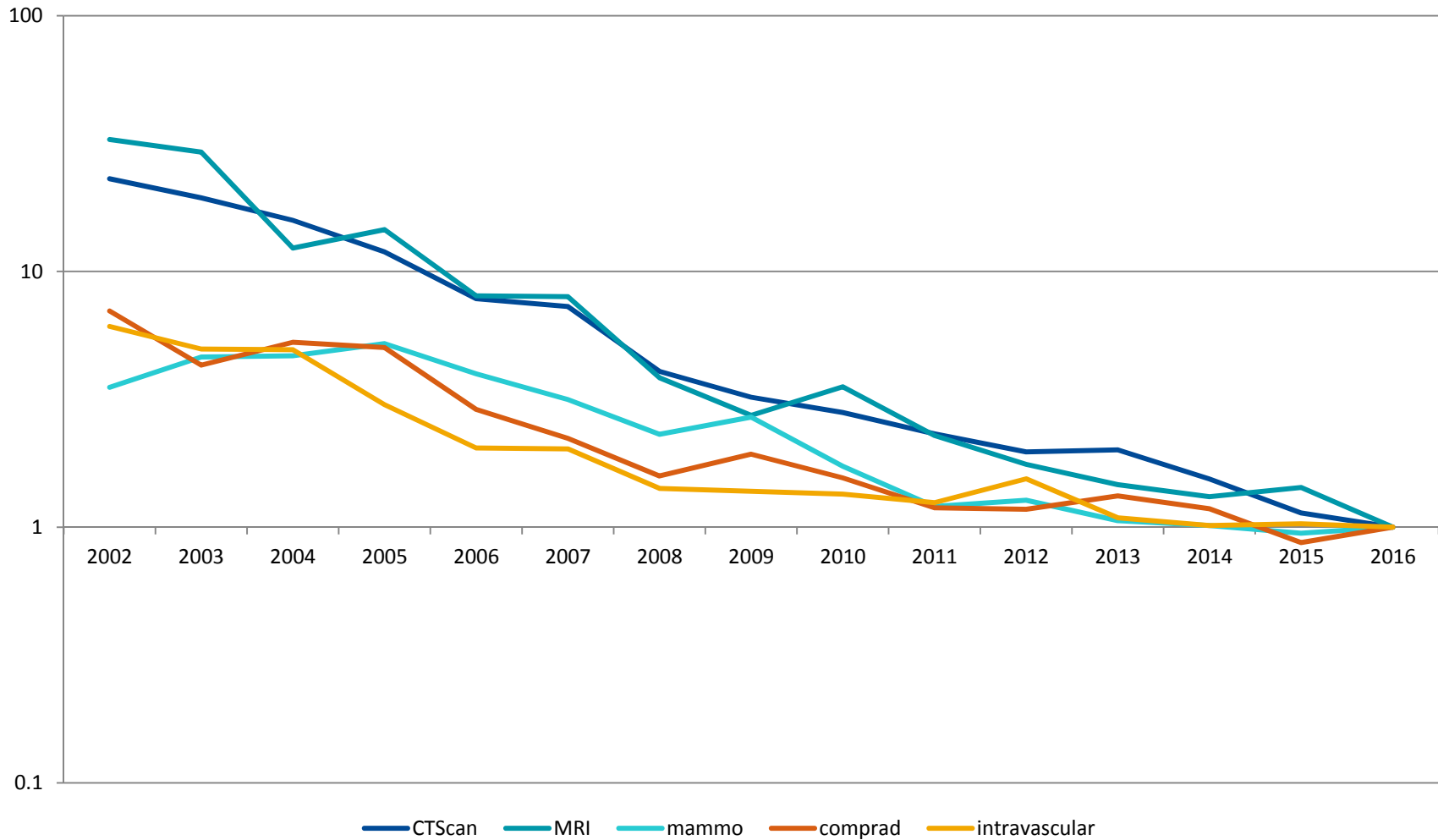
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- Private fixed investment in electro-medical equipment over \$40 billion
- Rapid rates of product innovation
- Initial analysis suggests that price declines for imaging equipment range from about 25% per year for MRI and CTSCAN machines to about 10% per year for ultrasound machines

Source: Authors' calculations based on ECRI data



# Matched Model Price Indexes



Source: Authors' calculations based on ECRI data

# Which Attributes Are Relevant?

DETECTOR	X-RAY TUBE	RADIATION DOSE
Field of view (standard), cm	Heat storage, MHU	Dose-modulation technique
Field of view (extended), cm	Heat dissipation rate, kHU/min	Pediatric-specific dose control
Total detector width, z-axis, mm	Tube cooling	Prospective ECG gating
Reconstructed slice width options, mm	Tube focal spots, mm	Retrospective ECG editing
Optional minimum slice width, mm	Expected tube life, scan sec (and	Iterative image reconstruction
Standard rotation times, sec, 360°	Max mA for smallest tube spot	Sliding collimation (overbeaming
Optional minimum rotation time, sec	Max scan time at max mA, sec	Axial cardiac
PERFORMANCE	X-RAY GENERATOR	IMAGE RECONSTRUCTION
High-contrast spatial resolution	kW output	Computer CPU
MTF kernel	kVp range	Reconstruction FOVs, cm
Low-contrast resolution, mm at % at	PATIENT TABLE	Reconstruction matrices
Noise, % at $\leq 25$ mGy (2.5 rads)	Range of movement	Max reconstruction rate, (512 x 512),
Noise kernel	Scannable range, cm	Per slice, sec
GANTRY	Max load capacity without restrictions,	Real-time partial image reconstruction
Gantry tilt, °	Optional max load capacity, with	SYSTEM INTEGRATION
Gantry dimensions, H x W x D, cm	RECOMMENDED ROOM SIZE, m <sup>2</sup>	DICOM
Gantry weight, kg	Minimum W x L, m	IMAGE PROCESSING
Gantry aperture, cm	POWER REQUIREMENTS	Standard or optional
Scan localizer	SHIELDING REQUIREMENTS	Recommended postprocessing

# Smart Phones

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- Business and government purchases included in fixed investment in communications equipment
- Consumer expenditures included in telephone and facsimile equipment
- Smart phones are imported

- Completed pilot for iPhones
  - Matched model indexes, 2015-2016
  - Researching hedonic regressions
  
- Purchased historical data back to 2004
  - Will construct historical indexes for all phones, we think in time to inform the 2018CU

# Rapid Rate of Product Innovation

