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A Test of Hedonic Price Indexes for Imports

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Potential Sources of Bias in a Matched Model Import Price Index

- US MPI and XPI are matched model indexes
- Matched model indexes are calculated from subsamples containing just the continuing items
- Price level difference between original and replacement item treated as if quality-related
- Changes in sourcing to emerging economies may have caused price declines for imports that MPI didn't reflect
- Growth in high tech trade also part of globalization; new models may enter with lower quality-adjusted prices

Hedonic Price Indexes for Imports

- Available empirical evidence on biases in the MPI is all indirect
- Hedonic price indexes have potential to provide direct evidence on biases from changing sourcing and the entry of new models embodying more advanced technology
- It's worth noting that there are some hypothesized biases associated with growth in import prices that can't be fully addressed by hedonic indexes either because a different kind of sample would be needed or because of the inherent nature of the effect
- These involve offshoring (movement of production from local to foreign) and import buyers' taste for variety

Hedonic Price Indexes for Imports

- Hedonic price indexes haven't been tested on import price index data sets
- Poor information on item characteristics is one reason
- We wanted to show that hedonics are feasible for imports
- Also want to develop direct empirical evidence on hypothesized biases in MPI
- We estimate hedonic import indexes for two products that have been subject to sourcing changes and technological progress, televisions and cameras

Data for this Study

- We used the micro data from the International Price Program at the Bureau of Labor Statistics (BLS) for this study
- Products studied were imports of televisions from 2000-2010 and imports of consumer cameras from 2000 to 2006
- Use item description field for basic characteristics data
- Internet searches on make and model number enable us to fill in missing information on characteristics in most cases (though success rate lower for models that exited a long time ago)

Restrictions on what we can disclose

- Confidentiality restrictions prevent us from showing indexes at an unpublished level of aggregation
- We also can't provide the coefficient estimates that would enable readers to figure out our estimates of unpublished indexes
- But we can infer differences between matched model and hedonic indexes for unpublished items from differences in higher-level indexes and weighting information

Monthly Hazard Rates for Sample Exit

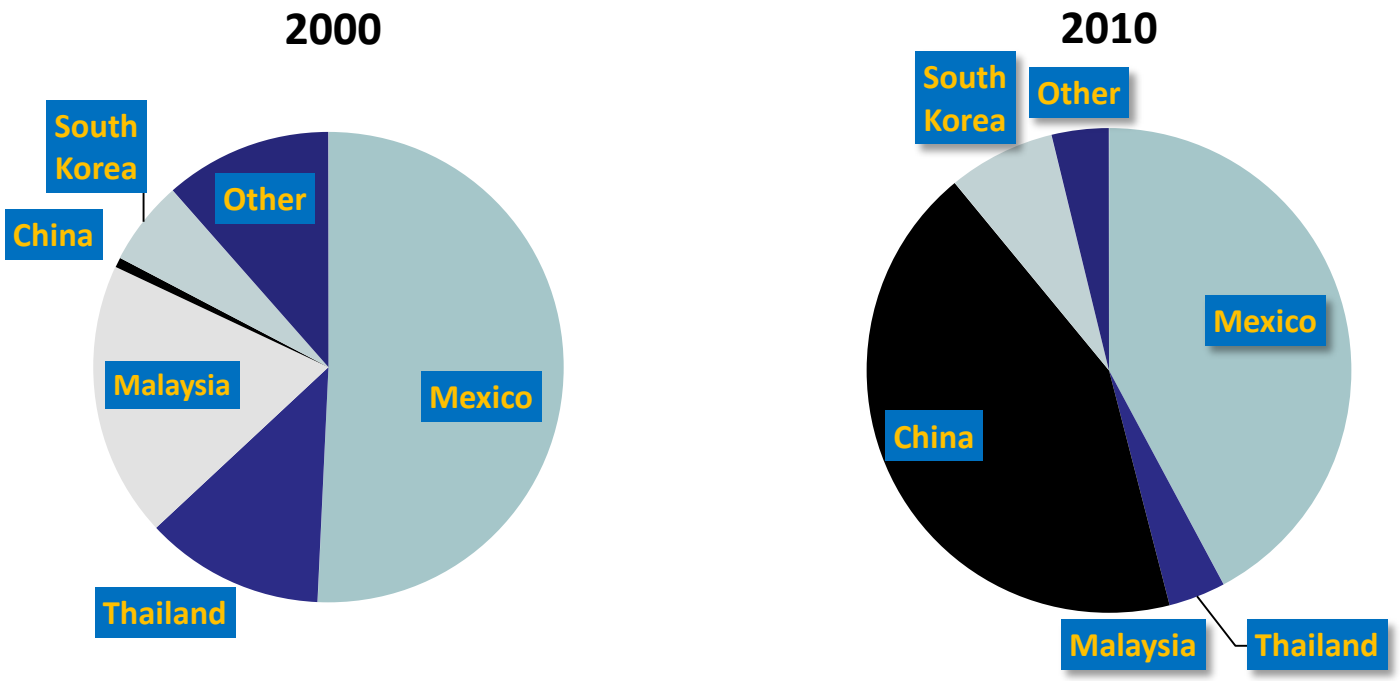
Type of Exit	Televisions	Cameras
Refusal	0.01	0.00
Respondent out of business	0.00	0.00
Variety no longer imported	0.02	0.04
No longer imported, replacement selected	0.01	0.01

	Mean Duration of Quote in Sample	Mean Number of Price Changes during Duration in Sample
Televisions	18.1 months	6.4
Cameras	17.8 months	1.6

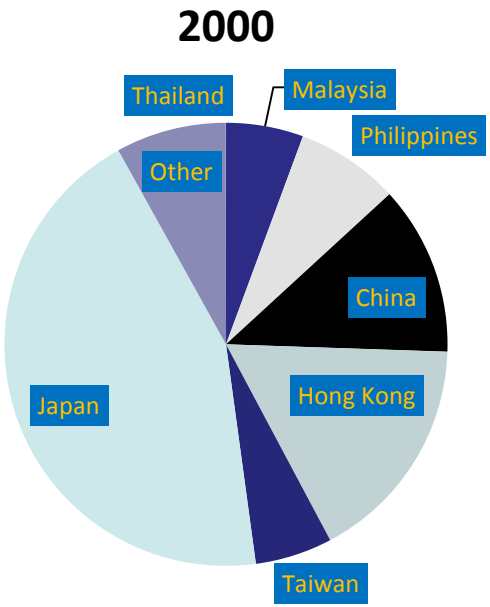
Weights to reflect actual sourcing patterns

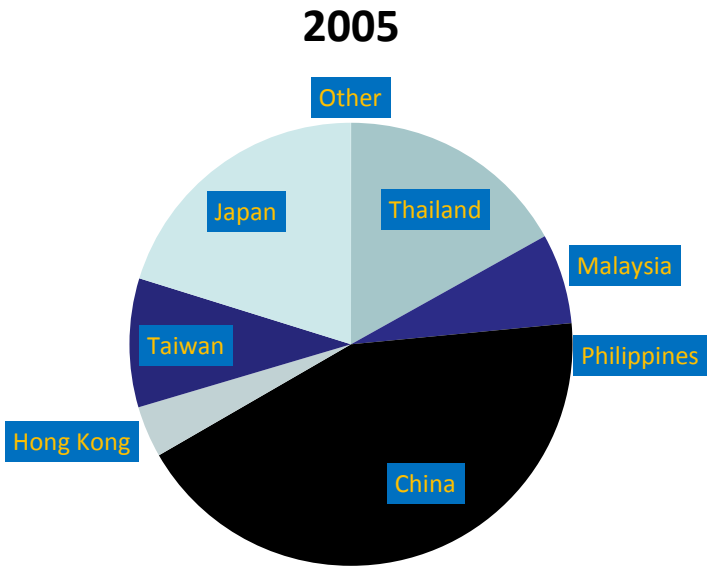
- To measure evolving mix of source countries, we use country weights from the Census Bureau's trade data
- The hedonic regressions incorporate those weights
- For TVs, China's share grew from negligible to over 40 percent; for cameras China grew from 15 to over 40 percent

Changing Source Countries for Televisions



Changing Source Countries for Cameras

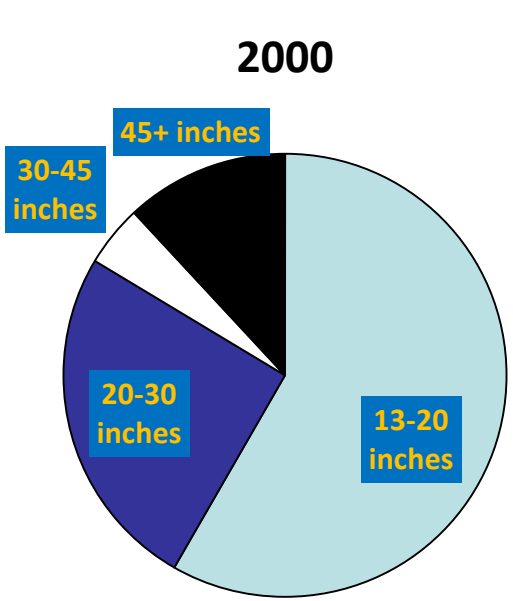


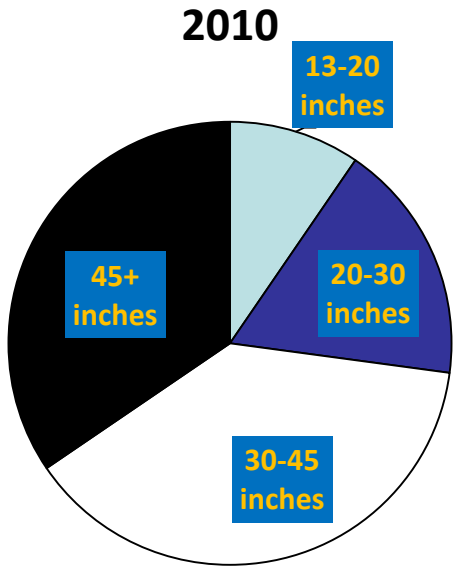


Advances in Technology

- Evidence from comparisons with other indexes suggests that upward bias present in US import price indexes for high tech goods and durable goods as a category.
- Treatment of quality change may be a factor in these discrepancies
- Substantial advance in technology for the goods and time period that we study
  - TV screens changed to flat screen from CRT
  - They also got a lot bigger
  - Low cost digital cameras became common

Television Screens Got Bigger





Hedonic Estimation of Sourcing Bias

Two ways to measure effects of country substitution:

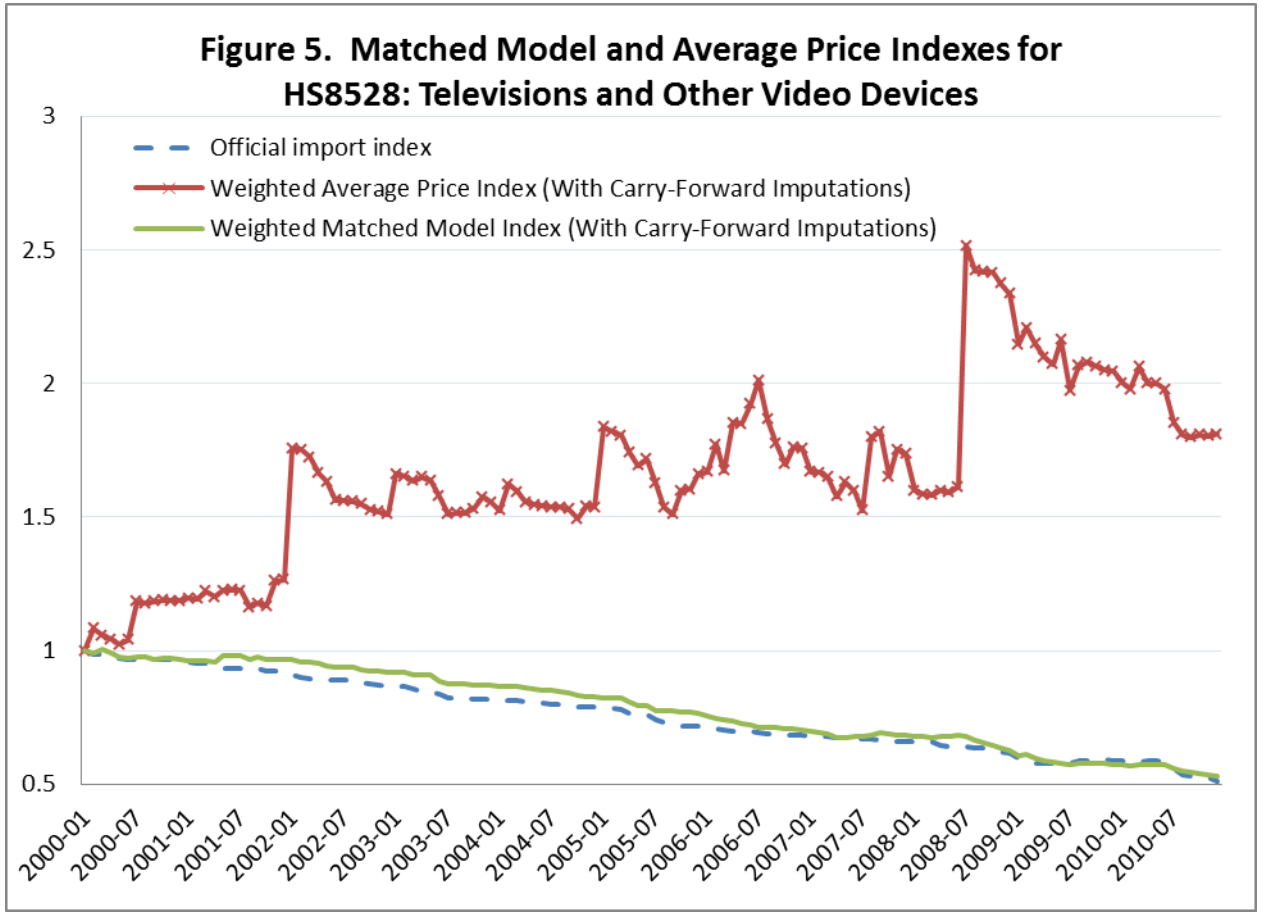
1. To treat price effects of changing source countries as quality changes, include country dummies in hedonic model; then, in a second hedonic model, treat price effects of changing source countries as true price changes by omitting the country dummies
2. Use coefficients on country dummies to predict the effect of changing country mix on the average price paid

- Method 2 is less susceptible to omitted variable bias, but its reliability can still be affected by multi-collinearity between changes in sourcing and changes in physical characteristics

Hedonic Specifications Tested

- General approach was to include characteristics and time dummies in the hedonic model explaining the log price; time dummies give log of index
- Test two approaches to specifying this type of hedonic model
- ***Pooled hedonic*** model imposes constant coefficients on characteristics, and also countries if country dummies included
- ***Moving window hedonic*** uses two-year overlapping samples to fit family of hedonic regressions
  - \+ Allows slope coefficients to evolve over time; e.g. if China entered with low price on CRT screen, opportunity cost of flat screen would rise
  - – Additional flexibility comes at cost of fewer degrees of freedom

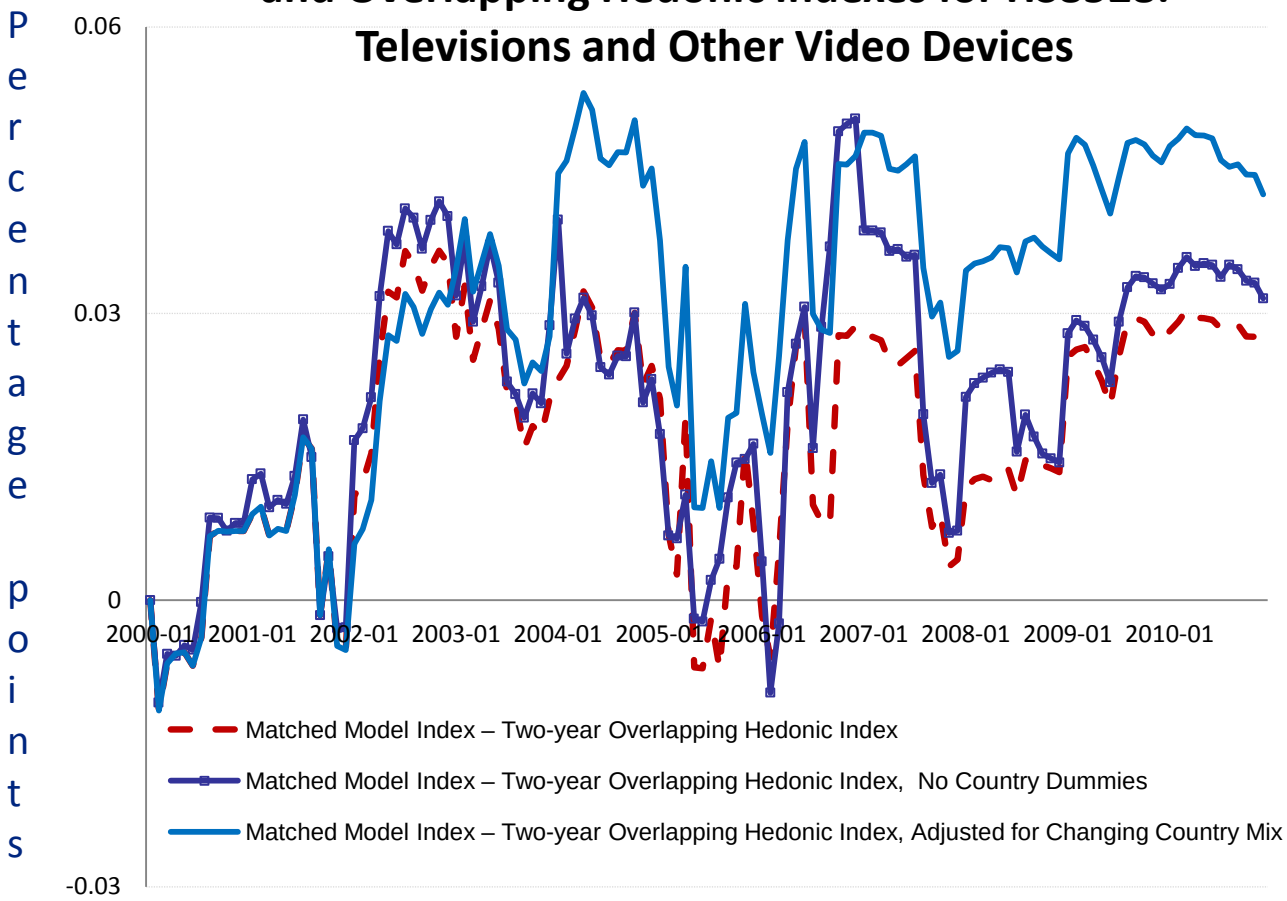
Matched Model and Average Price Indexes for Televisions and Other Video Devices reflect Improving Quality



	AAGR (pct/year)
official	–6.0
Matched models	–5.7
Average price	+5.7

Estimates of bias in MM MPI containing TVs implied by moving window hedonic

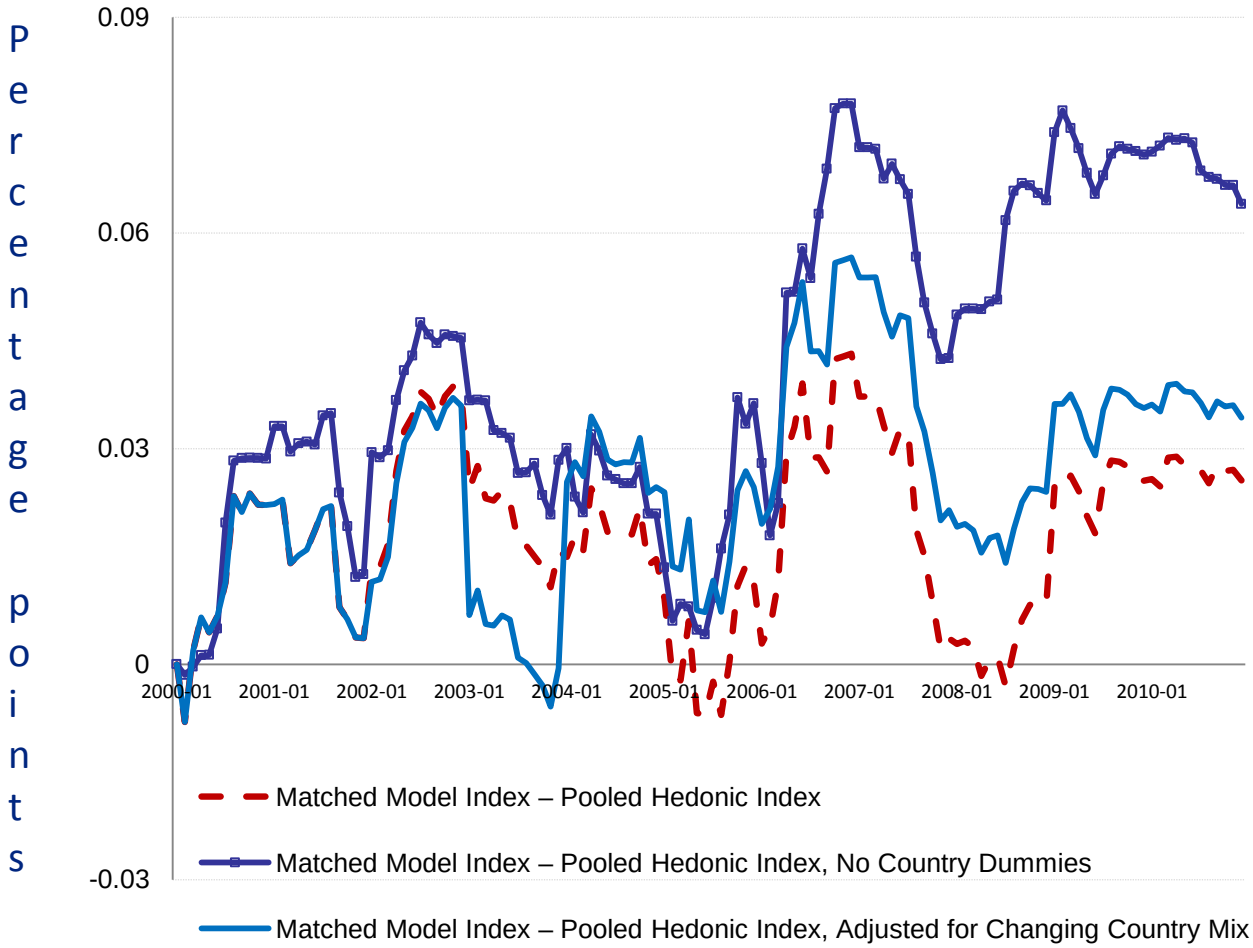
Figure 6. Differences between Matched Model and Overlapping Hedonic Indexes for HS8528: Televisions and Other Video Devices



Matched Models AAGR – Moving Window Hedonic AAGR	
Country dummies included	0.44
No country dummies	0.53
Adjusted for changing country mix	0.72

Bias in MM MPI containing TVs implied by pooled hedonic indexes

Figure 7. Differences between Matched Model and Hedonic Indexes for HS8528: Televisions and Other Video Devices



Matched Models AAGR – Pooled Hedonic AAGR	
Country dummies included	0.43
No country dummies	1.10
Adjusted for changing country mix	0.58

Isolating the Effects on the Television Index

- Televisions have weight of 0.343 in indexes for HS 8528
- Divide the differences in log indexes for HS 8528 by 0.343 to recover differences from matched model index for televisions.

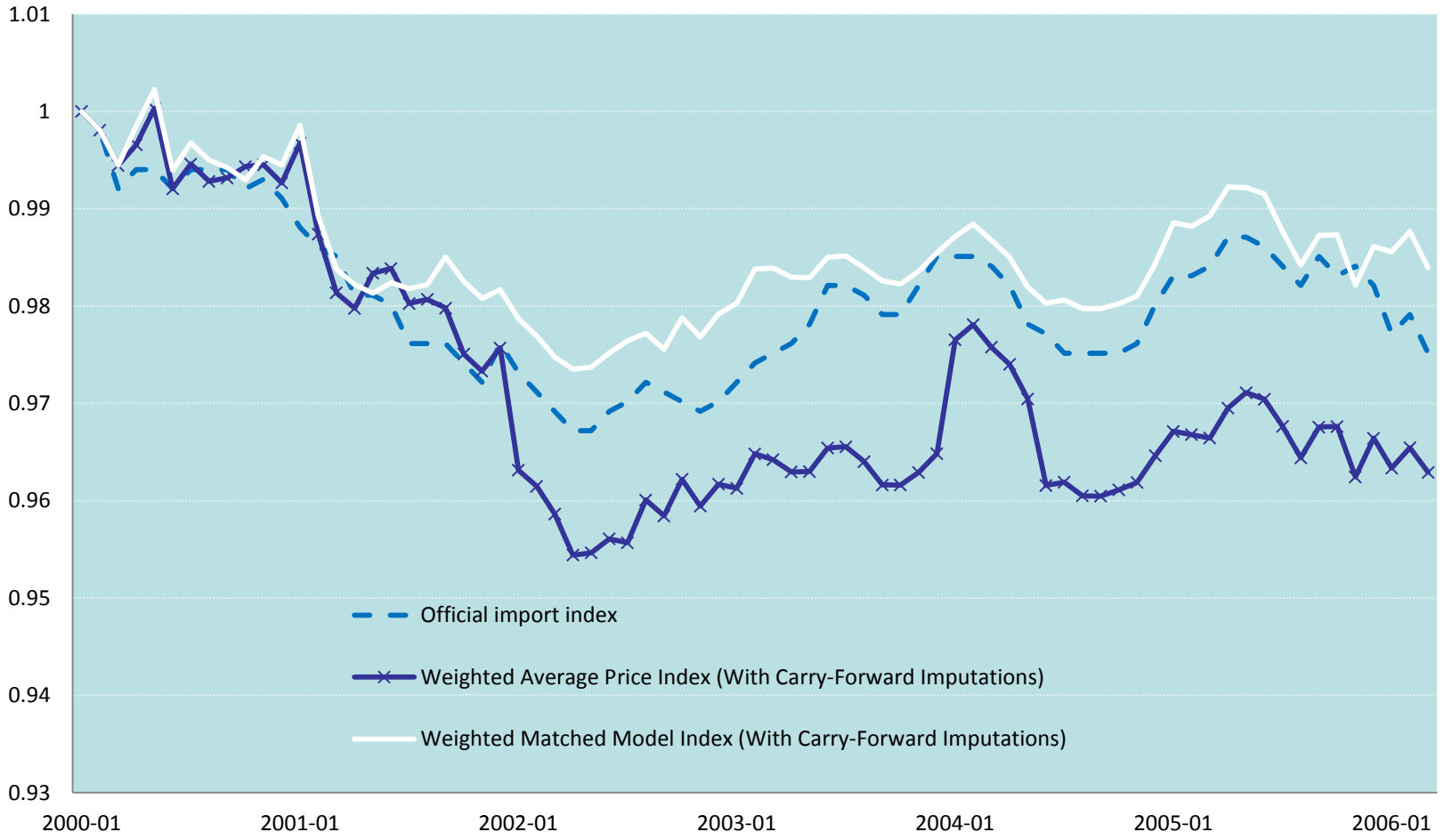
Range of estimates of bias in matched model index for television (percent per year)			
Type of Hedonic Regression	From hedonic regression with no country dummies	From using country coefficients to adjust for change in country mix	From hedonic regression with country dummies
Moving window	1.6	2.2	1.3
All years pooled	3.4	1.8	1.3

Estimates for Cameras

- For televisions, moving window approach and explicit adjustment for effect of changing source country mix seems to be the superior approach
- Cameras have smaller sample size and multi-collinearity between changes in source country and changes in characteristics also seems to be a problem
- Also the camera panel is shorter
- Need to conserve degrees of freedom favors the pooled approach in the case of cameras

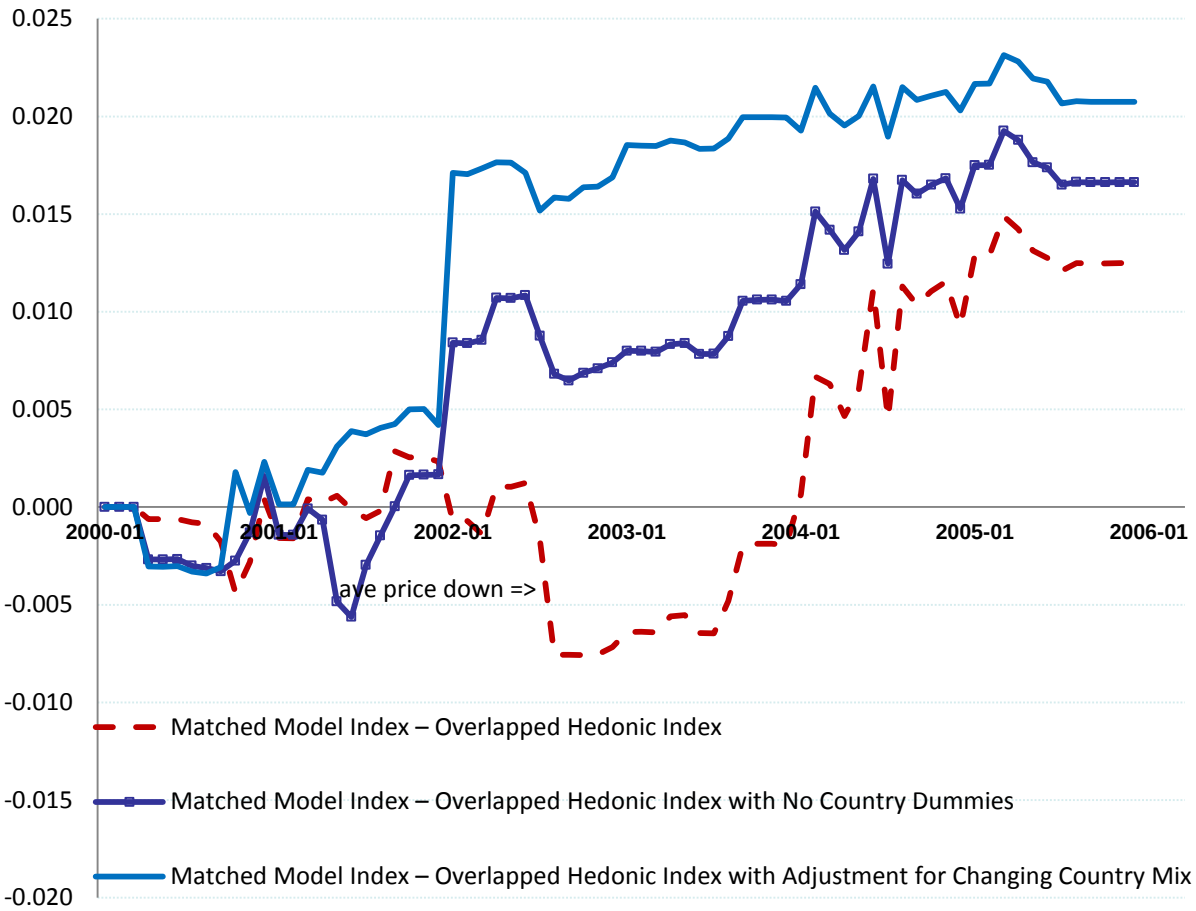
Matched Model > Average Price for HS 90

Figure 8. Matched Model and Average Price Indexes for HS 90: Cameras and Photographic, Measuring and Medical Instruments



Matched Model – Moving Window Hedonic Indexes for HS 90

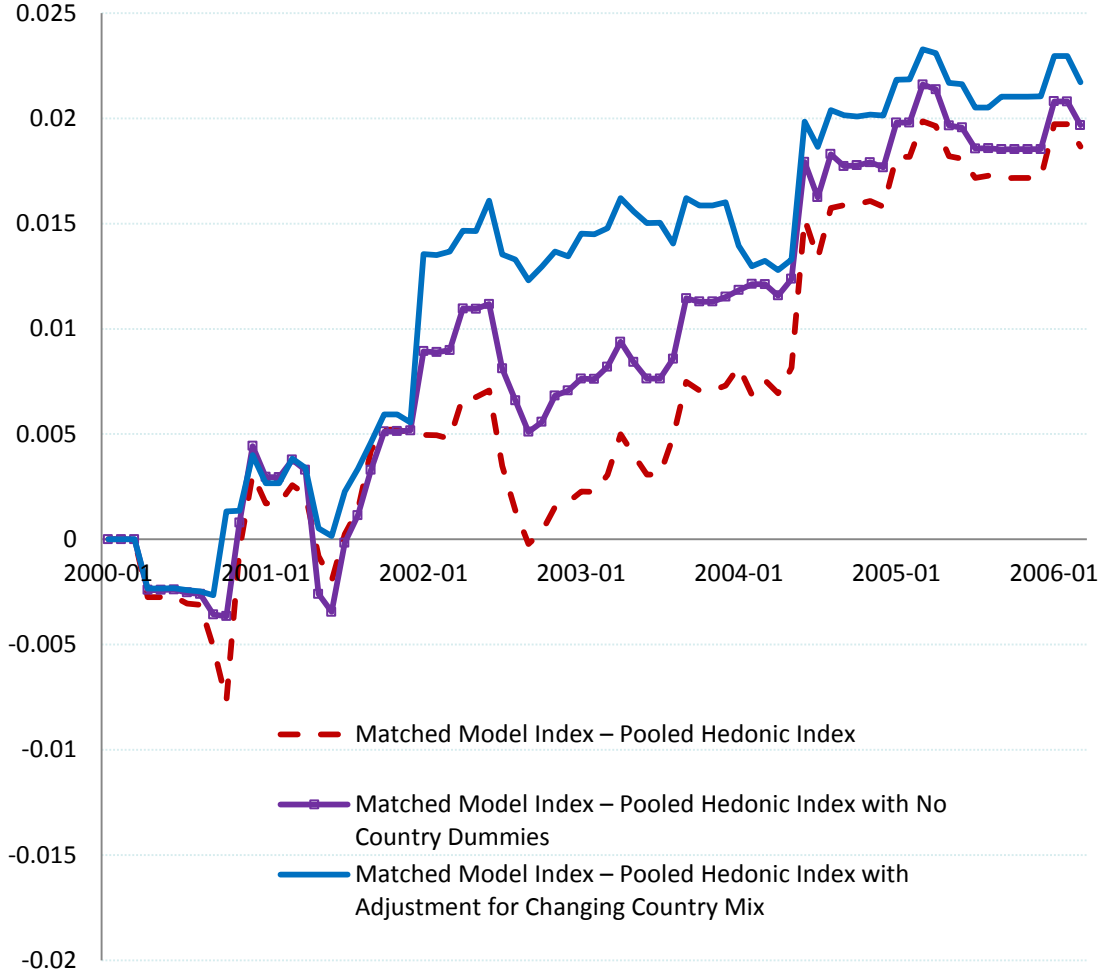
Figure 9. Differences between Matched Model Index and Hedonic Indexes for HS90: Cameras and Other Instruments



Matched Models AAGR – Moving Window Hedonic AAGR	
Country dummies included	0.21
No country dummies	0.29
Adjusted for changing country mix	0.36

Matched Model – Pooled Hedonic Indexes for HS 90

Figure 10. Differences between Matched Model Index and Hedonic Indexes for HS90: Cameras and Other Photographic, Measuring and Medical Instruments



Matched Models AAGR – Pooled Hedonic AAGR	
Country dummies included	0.31
No country dummies	0.33
Adjusted for changing country mix	0.36

Implied Bias in the Matched Model Index for Cameras (percent per year)

Type of Hedonic Regression	From hedonic regression with country dummies	From hedonic regression with no country dummies	From adjusting for change in countries using country coefficients
Moving window	6.7	9.0	11.4
All years pooled	5.8	8.1	10.5
All years pooled, same ending month as for moving window	9.3	10.1	11.6

Implied biases are based on weight of consumer cameras in HS90 being 1/30.

Conclusion

- We estimate hedonic indexes for two examples of imported products of concern, televisions and consumer cameras.
- Results support the hypothesis of upward bias due to changing country sourcing patterns.
- But unmeasured gains from improved technology also important
- For televisions, estimated bias from new technology is 1.3 pct/yr, implying bias of 0.9 pct/yr from changes in sourcing.
- For cameras, lowest estimates are 5.8 pct/yr and 2.3 pct/yr.
- If the sample size is large enough, moving window hedonic specification seems to work best
- but the smaller sample size of the camera indexes makes the more restrictive pooled approach represent a favorable trade-off of accepting a risk of bias to reduce the variance