Measurement of Depreciation Rates based on Disposal Asset Data in Japan

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Revision of Capital Stock Estimates in JSNA

Estimation of Aging-profiles of assets:

- Geometric for tangible assets and straight-line for software.
- Depreciation rates are based on the Tax-Lives .
- Some empirical evidence finds that δ(depreciation rates) assumed in the current JSNA may be inappropriate for some assets.

Assets	T	δ	NCS
Dwellings	28.0	7.9	251163
Non-residential buildings	37.4	6.0	250712
Other structures	33.7	6.6	190913
Transportation equipment	7.6	26.2	26332
Agriculture machinery	9.2	22.2	2902
Other machinery	10.6	19.5	175055
Cultivated assets	5.4	12.1	1674
Total	27.8	9.9	898749

Note: NCS is net capital stock at the end of 2000 (billion yen). The stocks depreciated by straight-line (infrastructure and software) are excluded in this table. (Nomura and Futakami, 2005)

Approaches to Estimate Aging-profiles

approach	good points	problems
Tax-lives	·easy to collect	·uncertain sources ·hard to connect to asset (product) classification ·tends to be shorter than actual life
Registration data (administrative records)	·very good source to estimate service lives ·covers all assets for particular type of assets	·available assets are limited (dwellings, buildings, transportation equipment)
Market price data of aged assets (second-hand, rentals, or insurance)	·good source to estimate Age-Price Profiles(APP).	·needs an assumption of surviving rates to correct sample biases ·lemons bias ·markets are limited (buildings, motor vehicles, ships)
Disposal data	·good source to estimates survival function and APP (no need to assume survival functions, a priori) ·covers many types of asset ·larger samples	·sample biases in disposal data ·immature second-hand market: representativeness ·lemons bias

Disposal Survey (1)
-Characteristics of Disposal data

Disposal and Discard

Disposal
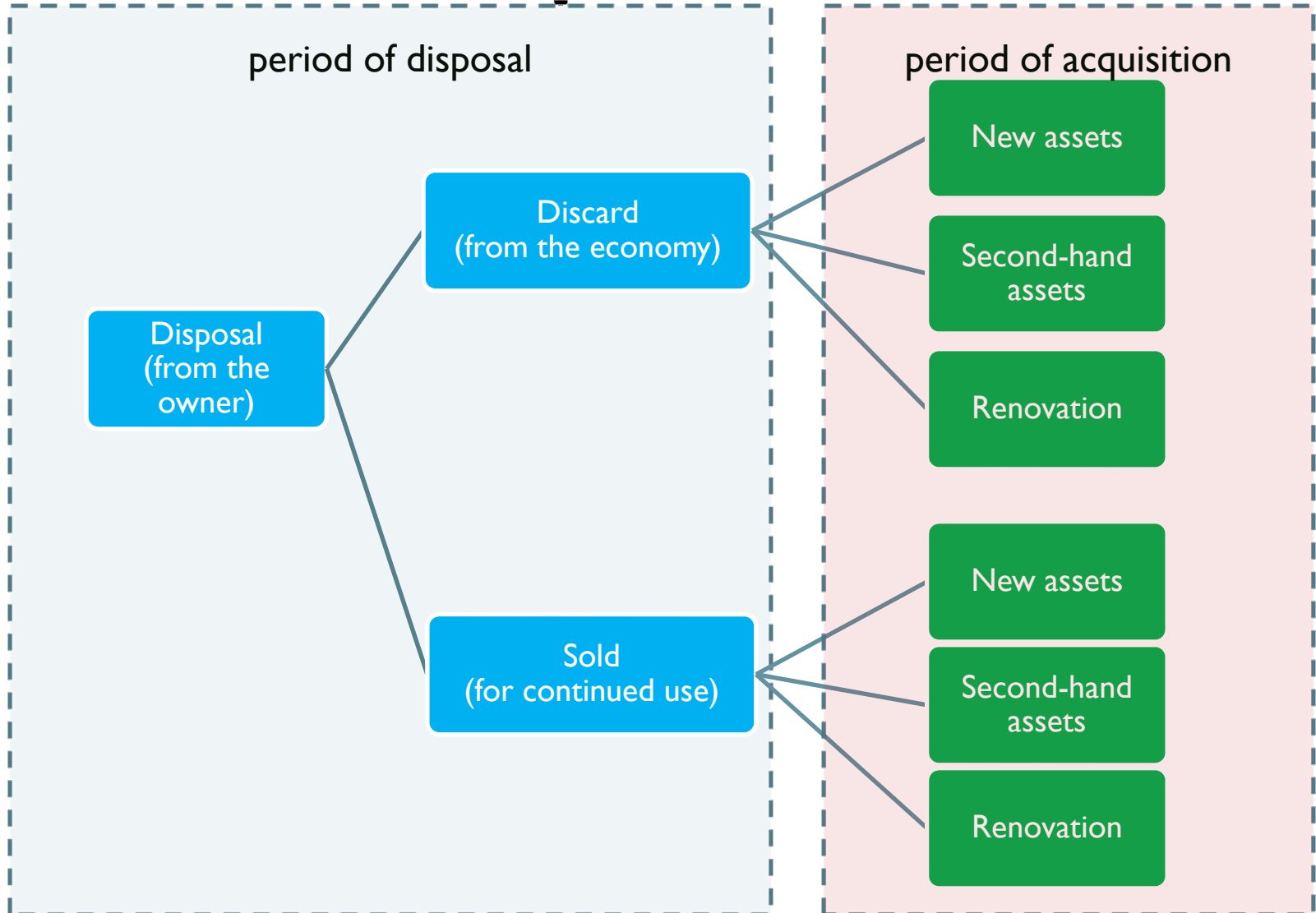(withdrawal of assets
from the owner)

Discard
(withdrawal of assets
from the economy)

Sold
(as second-hand assets
for continued use)

Disposal Survey (2)
-Characteristics of Disposal Data

period of disposal

period of acquisition

Disposal (from the owner)

Discard (from the economy)

Sold (for continued use)

New assets

Second-hand assets

Renovation

New assets

Second-hand assets

Renovation

Disposal Survey (3)
-Disaggregation of Asset

○ More than 600 assets at the most detailed level for better homogeneity within each type of asset.

○ Roughly, survival function can be estimated for 300-400 types of assets and Age-Price Profile for 200 types of assets.

○ Disaggregation enables us
  - to evaluate technological changes embodied in capital (e.g. ICT-related, industrial robots, etc).
  - to estimate average depreciation rates for the past or other countries, reflecting the differences in asset compositions and industry structure over periods or across countries.

Six broad groups of assets	Number of assets
1. Buildings	66
2. Equipment attached to buildings	41
3. Structures	47
4. Machineries	172
5. Transportation equipment	56
6. Other machinery and equipment	257
sum	639

# Methodology

Discard (survival function)

- ◦ The Weibull distribution: $S(n) = EXP[-(n/\lambda)\alpha]$
  - • n: age, λ: scale parameter, α: shape parameter
  - • The results are comparable with the estimates in Netherlands (Meinen et al, 1998; Erumban, 2008), Canada (Statistics Canada, 2008), and Japan (Nomura, 2005b).
- ◦ Number of asset samples: about 180,000 discard data (excluding sold assets)

Depreciation (age-price profiles)

- ◦ As a basic framework, we follows Hulten-Wykoff method.
  - • To correct the sampling biases, we use the estimated Weibull survival probability.
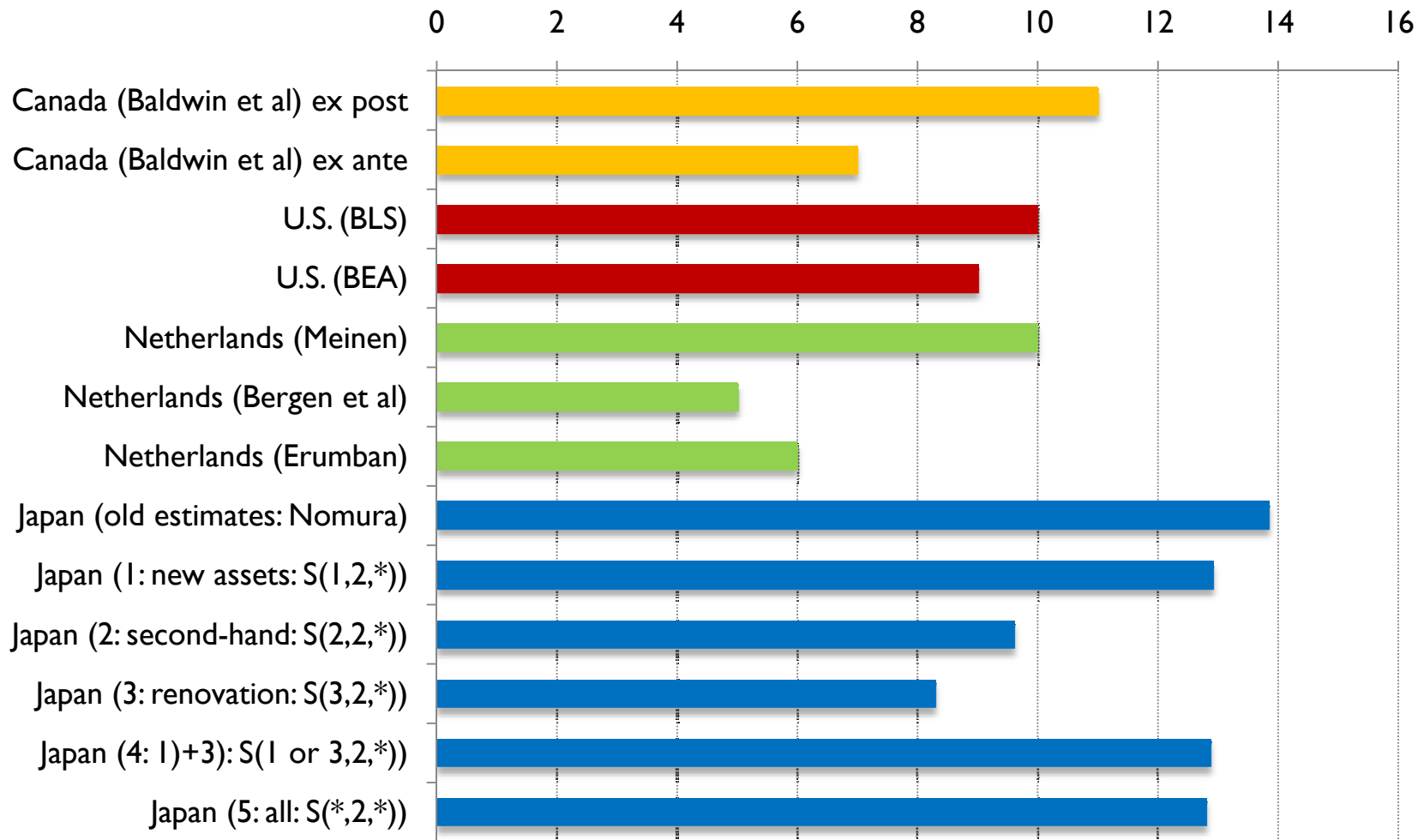- ◦ Number of asset samples: about 26,000

Summary of Average Service Lives
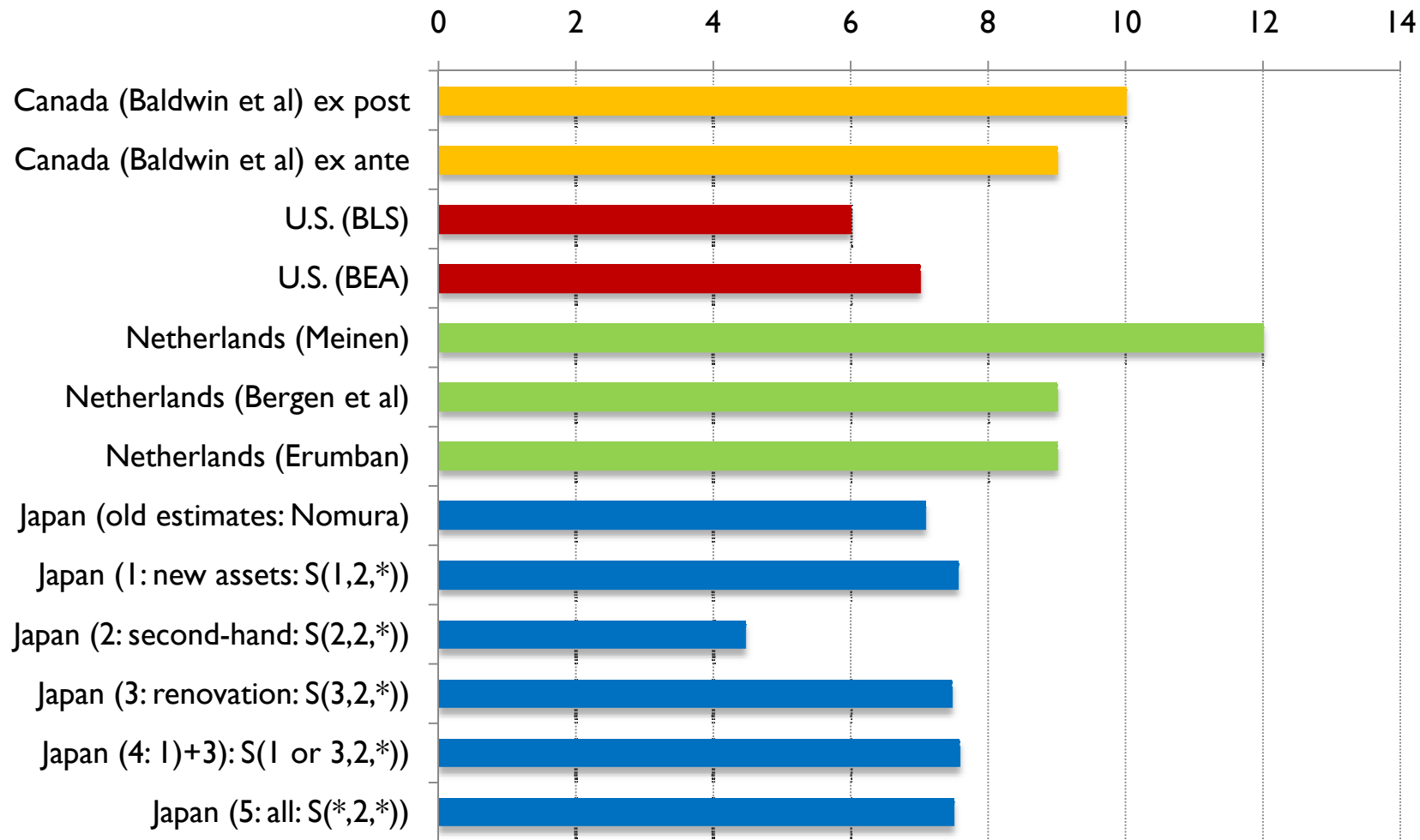## - Comparison with Canadian Estimates
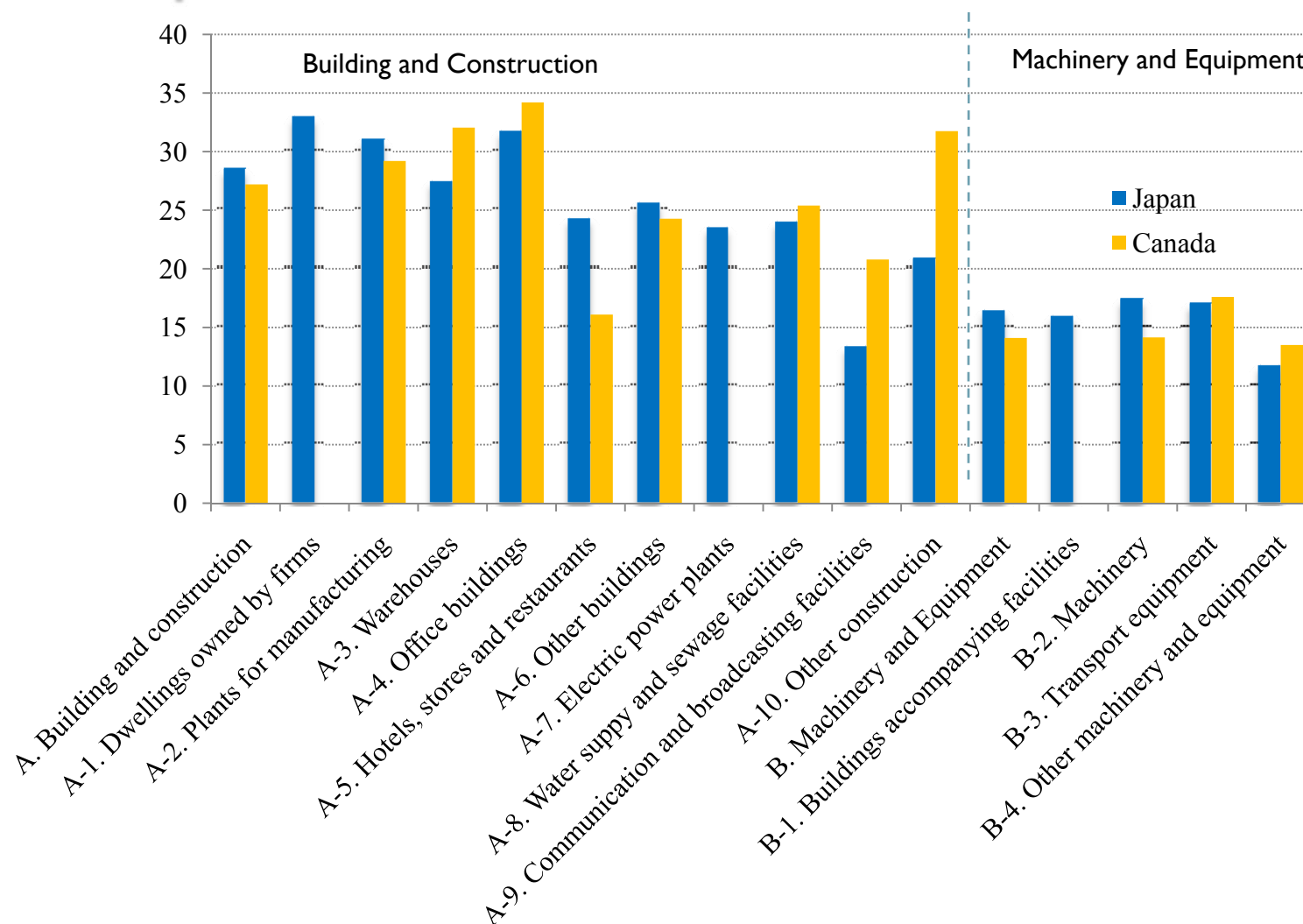
Note: See Statistics Canada (2008) for the Estimates in Canada.

Comparison of Average Service Lives -Transport Equipment (motor vehicle)
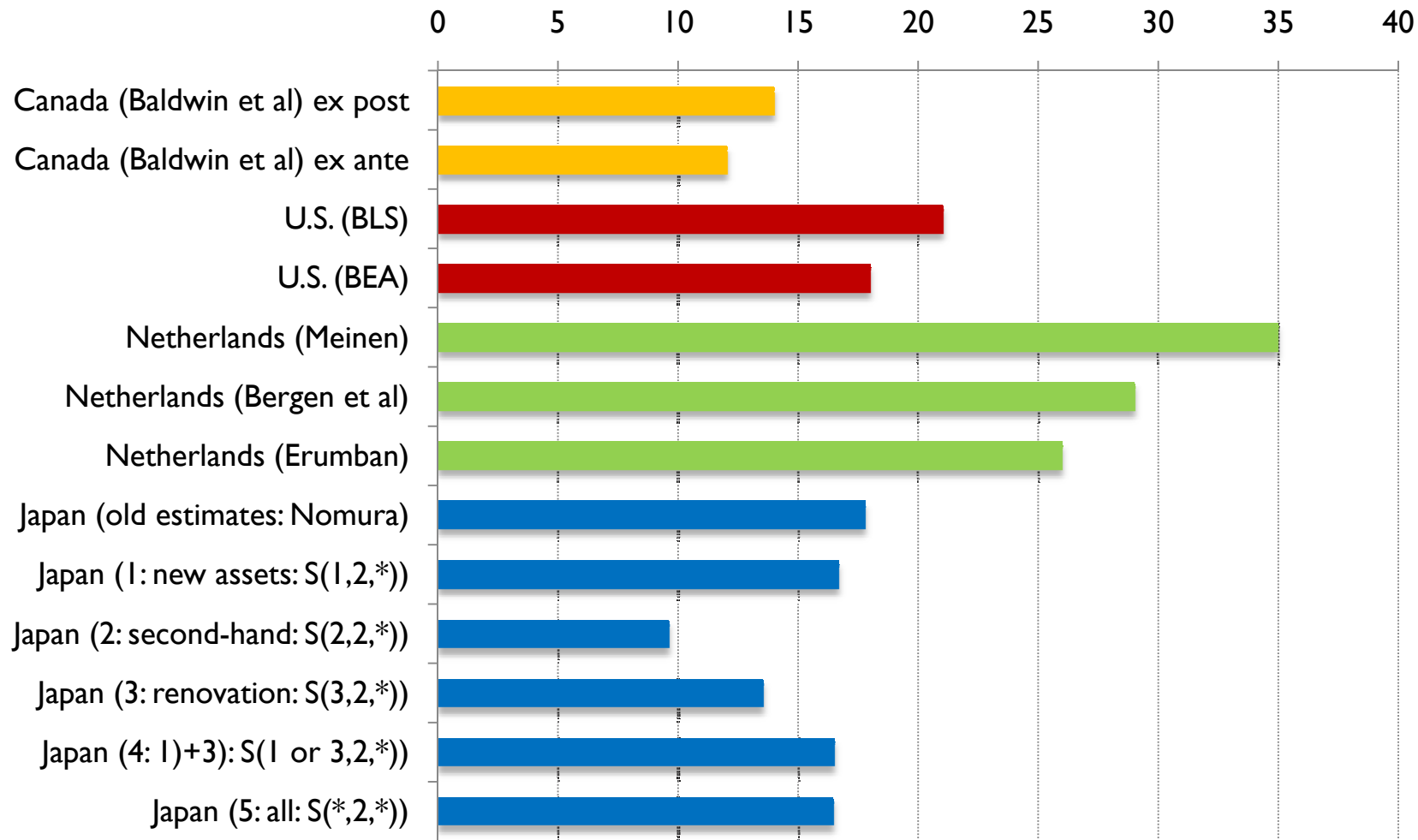

Note: The estimates for Canada, the U.S., and the Netherlands are based on Table 9 in Erumban (2008).
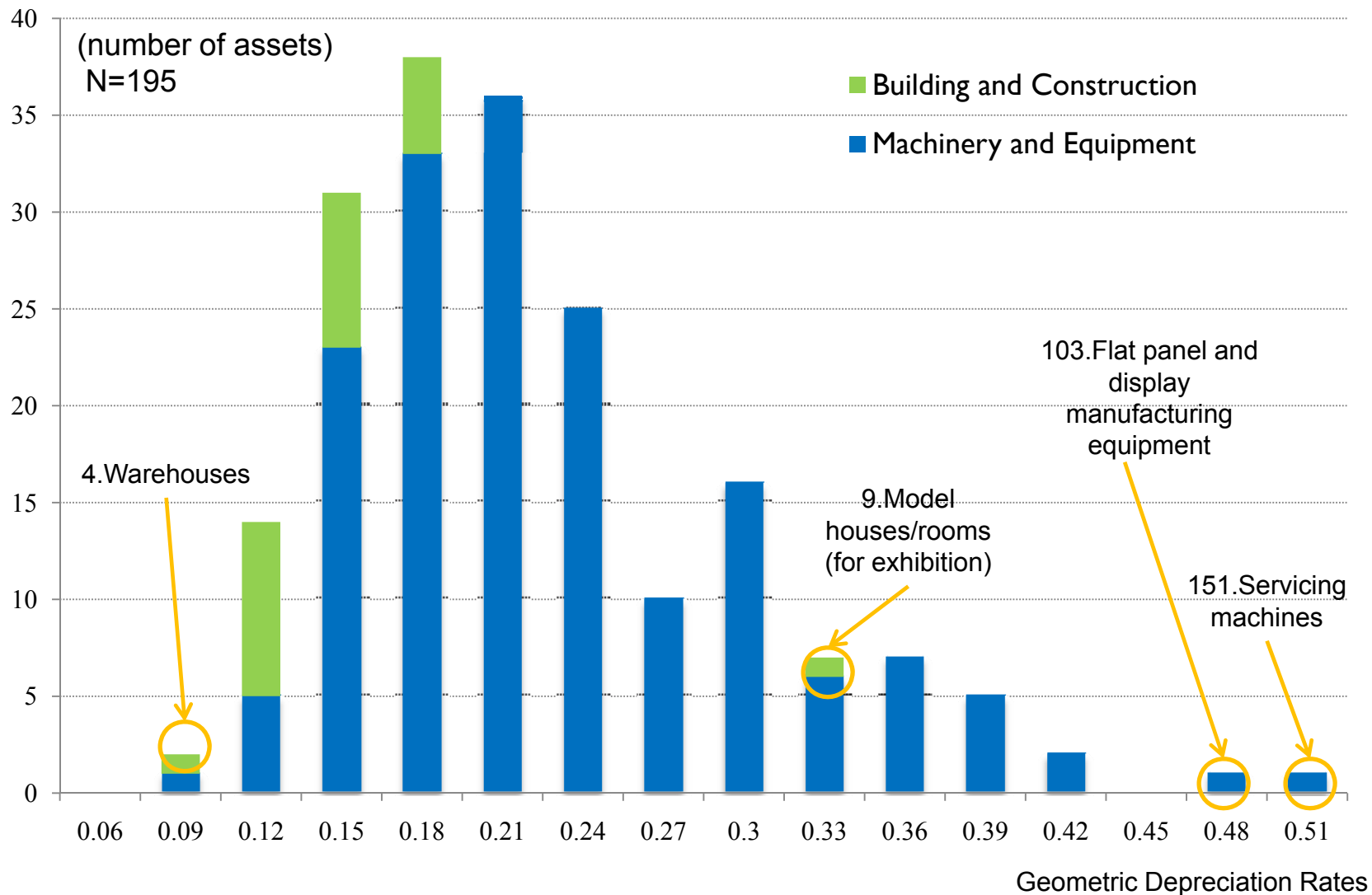
Comparison of Average Service Lives -Computers

Note: The estimates for Canada, the U.S., and the Netherlands are based on Table 9 in Erumban (2008).

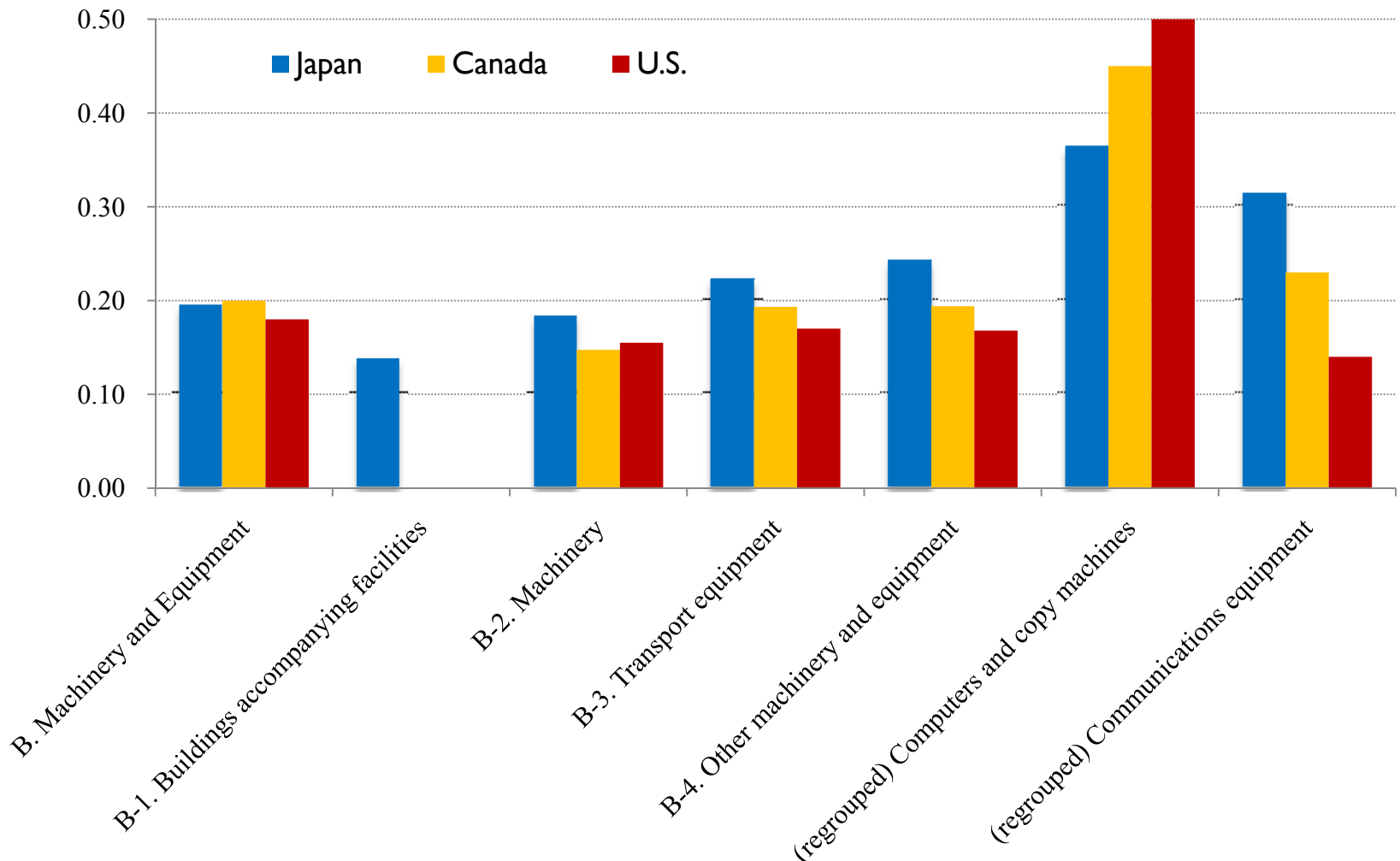# Comparison of Average Service Lives -Machinery and Equipment

Note: The estimates for Canada, the U.S., and the Netherlands are based on Table 9 in Erumban (2008).
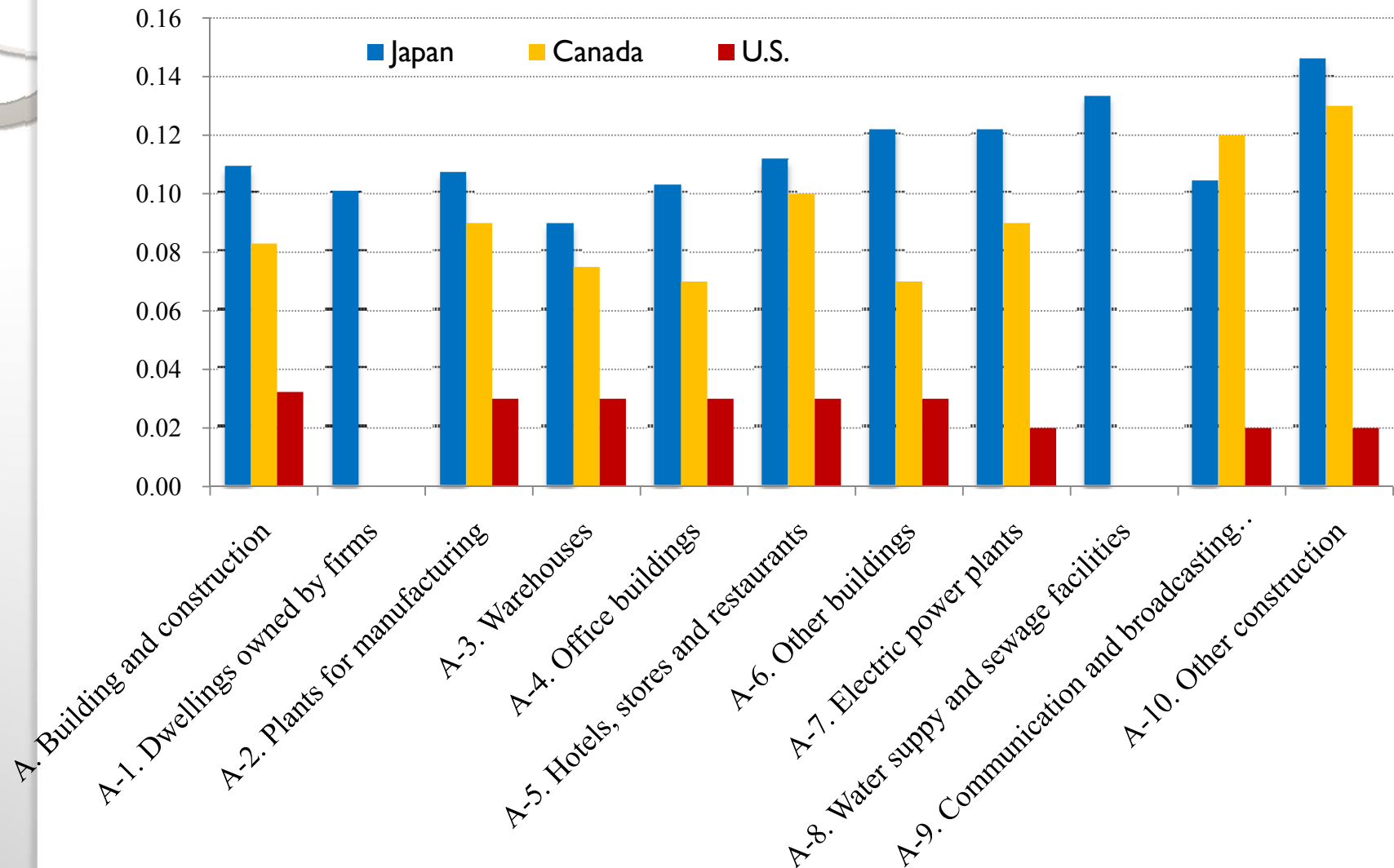
Geometric Depreciation Rates - Histogram

Geometric Depreciation Rates for Machinery and Equipment
- Comparison with Canada and the U.S.

Note: See Statistics Canada (2008) for the Estimates in Canada and the U.S. (BEA).

Geometric Depreciation Rates
for Building and Construction
- Comparison with Canada and the U.S.

Note: See Statistics Canada (2008) for the Estimates in Canada and the U.S. (BEA).

Thank you very much

Comments welcome

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