

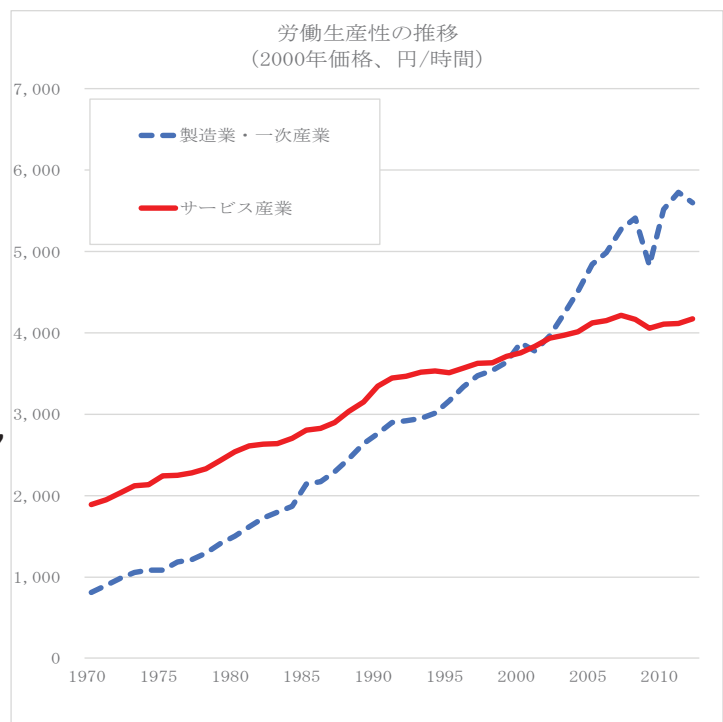
サービス産業における価格と生産性の計測

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1. はじめに

- 多くの先行研究は、日本のサービス産業の生産性上昇率が遅く、また欧米諸国と比較して、その生産性水準は半分程度であるとの指摘をしてきた（Inklaar and Timmer 2008, Fukao 2013, 経済産業省 2013, Jorgenson, Nomura and Samuels 2016）。
- 生産性の時間を通じた変化に関する推計は、物価統計やGDP統計に依存する。



出所：深尾（2017）。原データは一橋大学・経済産業研究所のJIPデータベース2015。

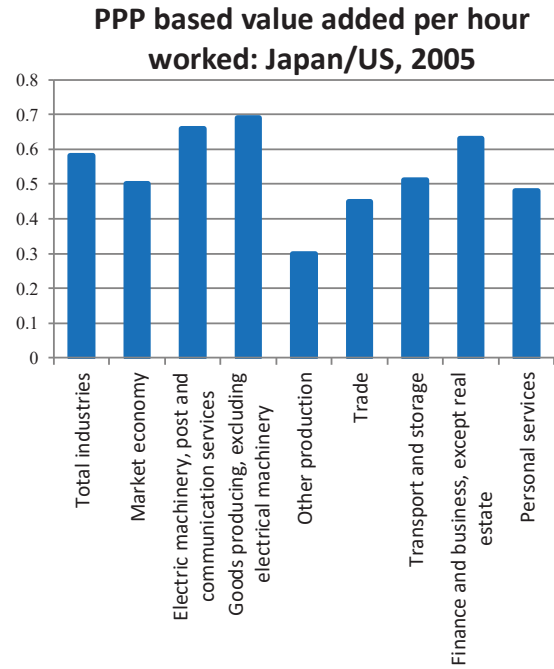
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ICP-PPPs as a basis for International Comparisons of Productivity

- Previous studies report lower service sector productivity in Japan compared to the US.

(Inklaar and Timmer 2008, Ministry of Economy, Trade and Industries 2013, Jorgenson, Nomura and Samuels 2016)

- These studies heavily rely on PPPs from the International Comparison Program (ICP) to compare sectoral gross output and input between Japan and the US.



Source: Inklaar and Timmer (2008)

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1. はじめに

サービス産業の生産性は本当に低いのか（サービス品質を反映した生産性計測、他産業・国際比較における課題）

広義のサービス産業と建設業（経済全体のうち一次産業と製造業以外）は、GDPの8割を占めるが、そのうち半分（GDPの4割）は、実質生産や質の計測に深刻な問題がある。

	Gross value added share in GDP			Man-hour input share in the total economy		
	US (2010)	UK (2010)	Japan (2012)	US (2010)	UK (2009)	Japan (2012)
Construction	3.6%	7.0%	6.1%	5.9%	8.2%	9.0%
Wholesale and retail	9.7%	10.8%	13.4%	13.5%	14.4%	14.4%
Education	5.9%	6.8%	3.5%	8.2%	6.9%	3.2%
Health care and social work	12.6%	8.1%	6.0%	17.9%	10.9%	10.6%
Public administration and defense, compulsory social security	4.2%	5.3%	9.3%	3.4%	5.7%	5.5%
Total	36.0%	37.9%	38.2%	48.9%	46.1%	42.7%

Source: Fukao, et al. (2016)

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1. はじめに

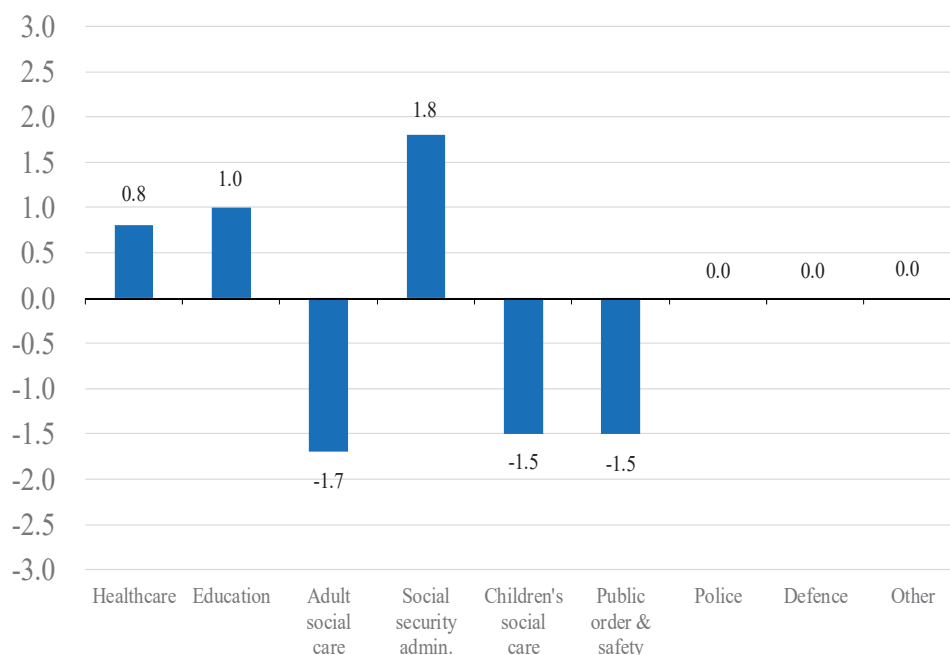
- 産業・企業レベルで生産性の上昇を計測するには、実質生産量変化のデータが必要である。その基礎となる日本の国民経済計算統計において、公務、教育の大部分、建設、社会福祉など、GDPの2割強を占める活動については、名目生産額を実質化するための適切な価格データ作成が困難であるとして、名目生産コストを、投入生産要素の価格指数で割った生産要素投入指数が実質生産指数の代わりに使われている。つまり、労働や資本の投入量で生産量を測っている（インプット＝アウトプット アプローチ）。このため、これらの産業では生産性の上昇が定義によってほぼゼロになる。

←多くの先進諸国では、価格データの新規作成（例：建築・土木）、アウトプットの数量指数（例：卒業者数）とサービスの質指数（例：学力テストの平均点）の組み合わせによる実質生産の把握、等が進められている（Atkinson 2005、OECDによる計測方法に関するマニュアル作成、欧州委員会におけるSPINTANプロジェクト等）。日本ではこの分野の研究・政府の取組が立ち後れている。

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2. サービス産業の生産性計測の課題（続）

英国公的サービス業におけるTFP上昇：1997－2012年、年率%



Source: ONS (2015)

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1. はじめに

報告の構成

第2節 日本政府による物価と実質生産計測における課題

第3節 サービス産業における生産性水準の国際比較における課題

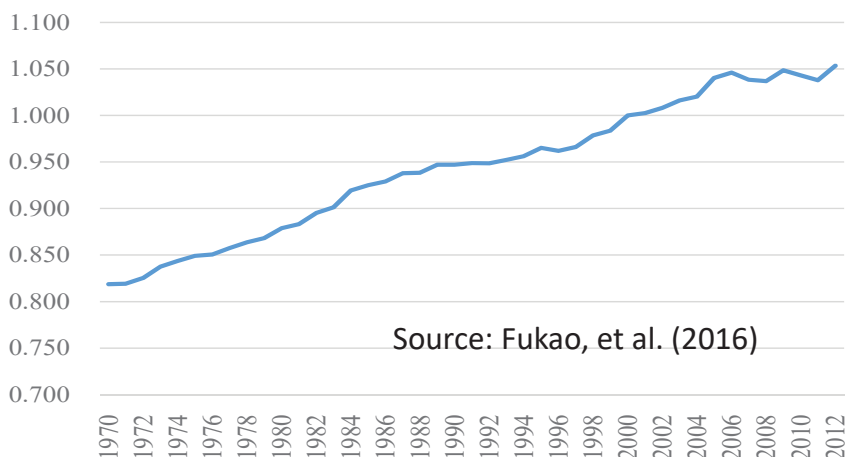
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2. 日本政府による物価と実質生産計測における課題

建設業

日本のGDP統計では、建設業や私立大学の教育等については、コストアプローチを採用しているのに、労働の質向上を考慮していない。建設業におけるこの無視により、政府・JIPデータベースは1973-2012年における日本全体のGDP成長とTFP上昇を1.7%ポイント過小に推計していると考えられる。

建設業における労働の質の推移：2000年=1、JIPデータベース

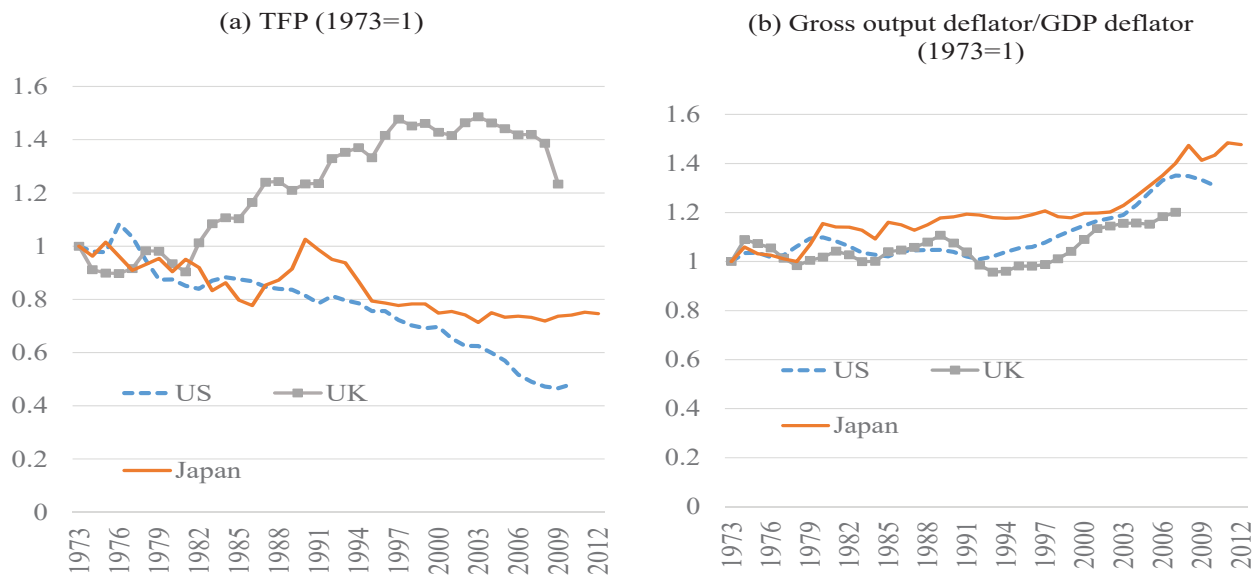


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2. 日本政府による物価と実質生産計測における課題

建設物の物価統計がある米・英のうち、米国については、日本より観察されるTFP上昇が特に高いわけではない。

建設業：日米英比較



Source: Fukao, et al. (2016)

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2. 日本政府による物価と実質生産計測における課題

- 卸・小売、医療などGDPの約2割を占める活動についても、**生産額を実質化するための物価統計に深刻な問題**がある。

商業：サービスの質（消費者への近接性、営業時間、取引形態等）変化の計測が必要（日本銀行調査統計局の企業向けサービス価格指数における新しい試み）。

医療：質の変化（疾患毎の死亡率の低下や生活の質の向上）を調整した生産量指標に基づいて生産性を計測する必要。

2. サービス産業の生産性計測の課題（続）

卸・小売業

OECD/Eurostat (2014)は、扱っている商品1単位あたりの商業サービスの質が不変なら、

商品1単位あたりのマージン価格 =
商品1単位あたりの販売価格 - 商品1単位あたりの仕入価格

を商業サービスの価格とするのが適当と推奨。米国とカナダのGDP統計は、この方式に移行済み。

日本をはじめ他の多くの国は、商品価格を商業サービスの価格としている（日銀は最近、一部商品の卸売業について、上記推計を試行）。マージン率（（販売価格 - 仕入価格） / 仕入価格）が変化すると、米加と日本の結果は大きく異なりうる。

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2. サービス産業の生産性計測の課題（続）

卸・小売業：2つのアプローチの違い

仕入価格不変の下で、同じ取引形態における商業のTFPが2倍となり、商品1単位取引のための生産要素投入量が半分になり、完全競争の下で、商業マージン率も半分になると、

米国ではデフレーターが半分になるため、商業の実質アウトプット（商業マージン / 商業デフレーター）は不変、TFPは2倍になる。

日本方式では、デフレーターは不変、実質アウトプット（商業マージン / 商業デフレーター）は半分となるため、TFPは不変となる。

なお、マージン率が高い取引形態へのシフトは、日本でも米国でも実質生産の拡大として認識される。

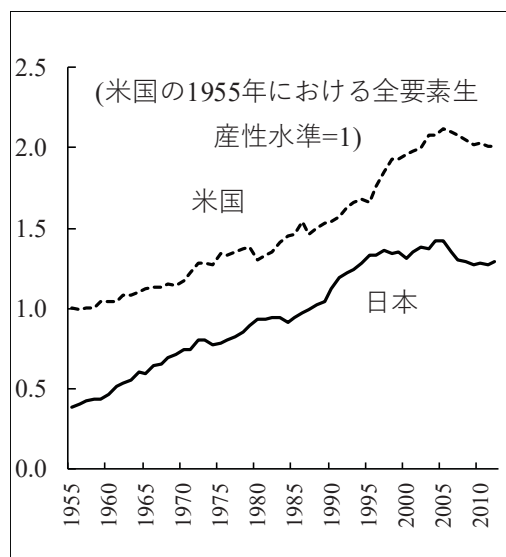
米国では、ヘドニック・アプローチによる質の計測も試行されている。

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2. サービス産業の生産性計測の課題（続）

米国では、TFP上昇が1990年代末より加速。新方式がいつまで遡及されているか、要確認。

卸・小売業：日米比較



出所：Jorgenson, Nomura and Samuels (2016).

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ICP-PPPs as a basis for International Comparisons of Productivity - continued

- As part of the ICP, the OECD requests governments of the participating countries to conduct price surveys to collect prices of specified items (specifications for each good and service are prescribed). Based on these reports, the OECD compiles the PPP data of the ICP.

For example, in the case of railway transportation in urban areas, the item for pricing is specified as

“an area ticket that allows changing to another mode of transport (such as a bus or tram) with a validity of 60 to 120 minutes for one ride, weekdays at 5pm”

- As this example shows, specifications of items are mainly based on European experience. Moreover, quality differences in the provision of services, such as the frequency of trains, delays, crimes, accidents, the cleanliness of trains, etc., are not taken into account (Tsukada 2017).

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How can we account for quality differences in price comparisons?

- There can be many factors that determine “quality”.
- Such factors are usually very hard to identify and measure.
- Service is a package of various unobservable factors.

Ask consumers directly

Conduct surveys on consumer preferences

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Objective of the paper

- We would like to quantify the welfare differences between US and Japan caused by differences in quality of services in US and Japan using quality adjusted quantity index numbers

$$Q_{US,Japan}^{QA} = Q_{US,Japan} |_{quality_unadjusted} \times \frac{Quality_{Japan}}{Quality_{US}}$$

- The quality un-adjusted quantity index is derived using PPP from ICP

$$Q_{US,Japan} |_{quality_unadjusted} = \frac{\sum_{i=1}^N P_{iJapan} q_{iJapan} / PPP_{US,Japan}}{\sum_{i=1}^N P_{iUS} q_{iUS}}$$

The objective is to estimate the *quality adjustment factor* using consumer surveys

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Identification Procedure (1)

Suppose services of the average Japanese quality were offered in the US in English.

If the Japanese service was better in quality than the corresponding US service, how much more would you be willing to pay for the Japanese service?



Relative MWP (or MRS) for Japanese Service Evaluated at the US Price by the US (price premium for higher quality of Japanese Services)



Relative MWP for JPN service by the US people = $(1 + b_{US})$

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- Q3** Suppose services of average Japanese quality were offered in the US in English.
 If the Japanese service was better in quality than the corresponding US service, how much more would you be willing to pay for the Japanese service?
 Conversely, if the Japanese service was worse in quality, how much cheaper would it have to be for you to choose it over the corresponding US service?
 * Please note that the numbers in the list below do not necessarily match the numbers in the explanation of service categories.
 *

	Japanese quality is worse and so I feel a discount is necessary	←How much cheaper would it have to be for you choose the Japanese service? How much more would you be willing to pay for the Japanese service? →													Japanese quality is better and so I would be willing to pay more
	60% or even more of a discount is necessary/will absolutely not use	-50%	-40%	-30%	-20%	-10%	0	+10%	+20%	+30%	+40%	+50%	Would be willing to pay 60% or even more		
1. Taxi Response to previous question: → (【Q2S1の選択内容】)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
2. Rental car Response to previous question: → (【Q2S2の選択内容】)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
3. Automobile repair Response to previous question: → (【Q2S3の選択内容】)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
4. Subway/urban commuter train Response to previous question: → (【Q2S4の選択内容】)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
5. Long-distance train Response to previous question: → (【Q2S5の選択内容】)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
6. Air travel Response to previous question: → (【Q2S6の選択内容】)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		

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US-Japan Survey: Quality differences and willingness to pay

- Survey was supported by funding from Japan Productivity Center
- Internet surveys were conducted both in Japan and the United States in February-April, 2017.
- Sampling 20-60s, reflecting the age-gender distribution in the census.
- Japanese Sample: From individuals who stayed in the United States at least for a period of **three months** since April, 2012.

Sample size: 519 (480 valid responses – eliminated extreme answers)

- US Sample: Individuals who stayed in Japan for at least **one month** since April, 2012. (initially imposing staying for three months or longer, but it was very hard to collect enough sample size)

Sample size: 528 (412 valid responses)

Service Industry

1	Taxi	15	Hotel (mid-range)
2	Rental car	16	Hotel (economy)
3	Automobile repair	17	ATM, money wiring service
4	Subway	18	Real-estate agent
5	Long-distance train	19	Hospital
6	Air travel	20	Postal mail
7	Parcel delivery service	21	Provider with a mobile phone line
8	Convenience store	22	TV reception service using cable, satellite, Wi-Fi, etc.
9	General merchandise store	23	Hair dressing/beauty services (including beauty salons)
10	Department store	24	Laundry
11	Coffee shop	25	Travel services
12	Hamburger restaurant	26	Electricity, gas, heat supply, sewerage and water distribution/pipe repairs & management
13	Casual dining restaurant	27	Museum/art gallery
14	Hotel (luxury)	28	University education

Estimation of Quality Difference and Willingness to Pay

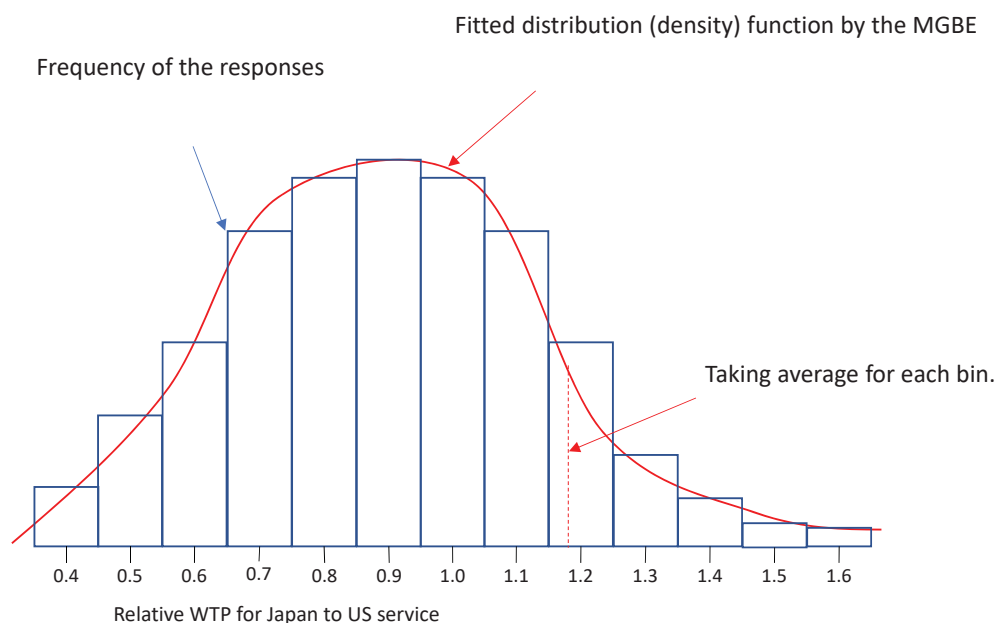
Two Issues:

- 1) Questionnaire has responses in intervals – converting them to single values
 - Use average of the intervals but poses problems with the final open-ended interval
- 2) Differences between population and sample characteristics indicates that self-selection could induce biases into estimates

We deal with both of these econometrically.

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Curve Fitting to Interval and Open Ended Data



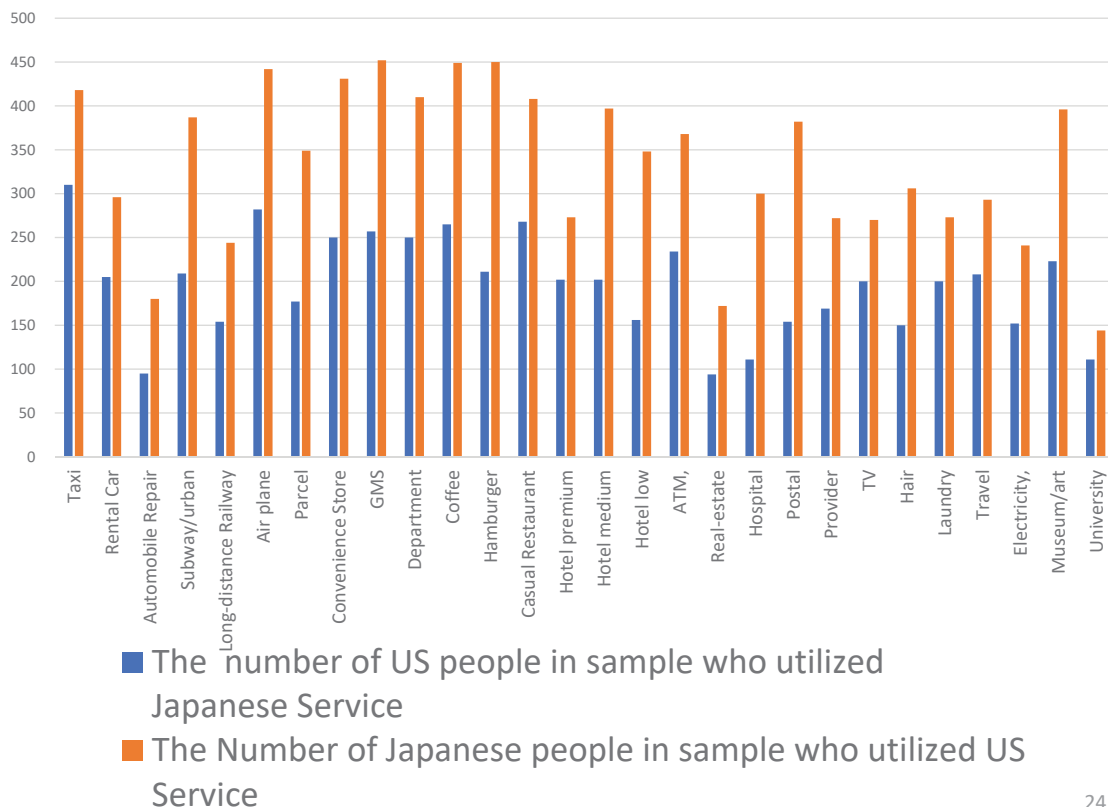
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Sample versus Population characteristics

	US		Japan	
	Survey	Nationwide	Survey	Nationwide
household income	\$107,902	\$53,889	¥9,772,578	¥5,458,000
age	35.522	37.6	44.315	46.4
female	0.473	0.508	0.500	0.514
famsize	3.145	2.64	3.042	2.38
univ graduate	0.553	0.205	0.702	0.299
marriage	0.326	0.524	0.704	0.589
Total Population		321419		127110

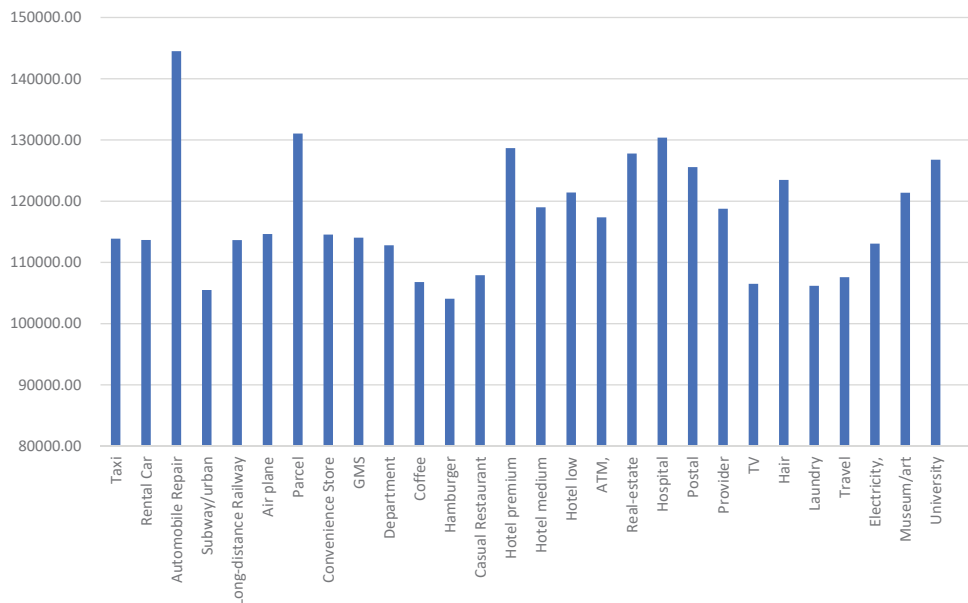
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Service Utilization



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Mean Income Differences (US)



The Average Income of US people who experienced Japanese services.

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Selection Biases

- The sample averages of income and other variables are different from those in the census and other survey.
- Two types of selection biases might exist
 - 1) Selection to visiting US or Japan
 - 2) Selection to utilizing particular service
- Unfortunately, 1) is very hard to deal with because of very tiny fraction of US people visit and stay in Japan for more than one month.
- We control for the second bias using Heckman's selection model.

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Estimation of Quality Difference and Willingness to Pay

- 1) Estimate both OLS and Heckman for each country and sector
- 2) Use the national average values for the covariates, construct the predicted values
- 3) If the inverse Mills ratio is significantly different from zero, use the predicted values from Heckman's model, otherwise, use estimates of OLS.

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Identification Procedure (2)

- From our survey, we can obtain two estimates of the relative price premium for Japanese Service
- Relative MWP for Japanese services by *US* people = $(1 + b_{US})$
- Relative MWP for US services by Japanese people = $(1 + b_{JPN})$
- Relative MWP for Japanese services by Japanese people = $\frac{1}{(1+b_{JPN})}$

If preferences in both countries are identical, $\frac{1}{(1+b_{JPN})} = (1 + b_{US})$

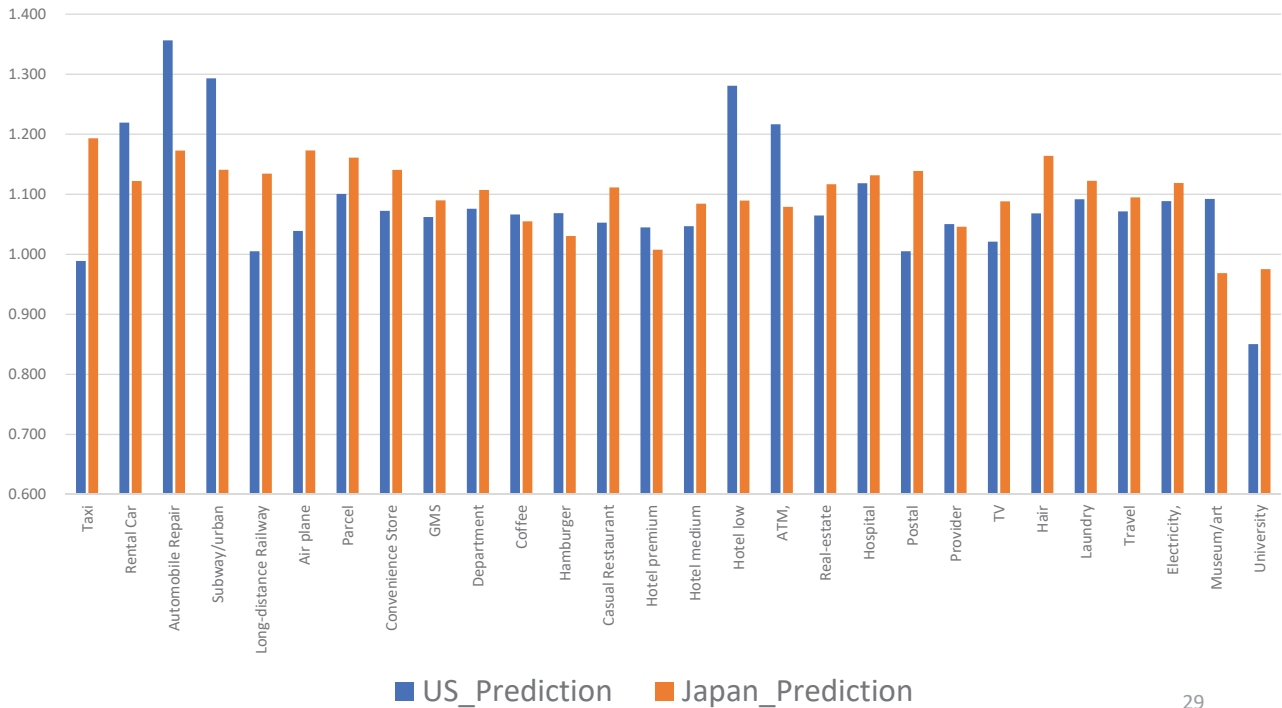
- As the quality adjustment ratio, we take the Geometric Mean of the two estimates:

$$\frac{(1+a_{JPN})}{(1+a_{US})} = \sqrt{\frac{(1+b_{JPN})}{(1+b_{US})}}$$

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Predicted National Average MWP service sectors - Japan/US

$$(1 + b_{JPN}) \text{ and } \left(\frac{1}{1+b_{US}}\right)$$

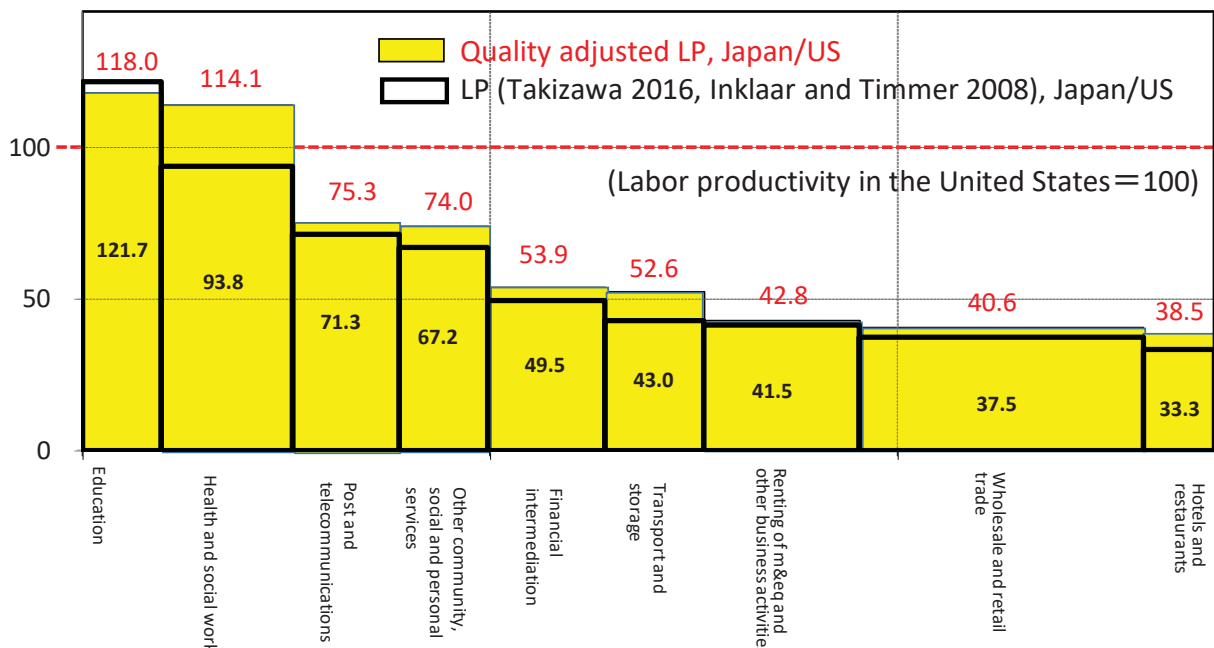


Implication for Japan-US Labor Productivity Gap

Quality Adjusted Labor productivity gap between Japan and the United States and value added share (2010-2012)

Labor productivity, Japan/US (US=100)
0 20

Value added share in Japan's total GDP
40 Total = 55.5%



We did not make quality adjustment of intermediate inputs.

Conclusions

- PPPs from ICP are used to convert service sector expenditures as well as outputs for international comparisons.
- While ICP uses Structured Product Descriptions to specify items for price surveys, these surveys do not adequately account for quality differences.
- To the extent quality differences are not captured, PPPs reflect both price as well as quality differences in the items priced.
- Quality differences are likely to be significant in service sector products (transport etc.) – at least anecdotal evidence suggests this.
- This paper represents first ever attempt to estimate PPPs for the services sector after adjustment for quality differences.

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Conclusions

- Conducted a special survey of consumers in Japan and USA who have spent a reasonable length of time in visitor countries
- The survey is facilitated by funding from Japan Productivity Center.
- Based on the analysis of data on differences in quality as perceived by consumers, a quality adjusted PPP is constructed.
- Econometric analysis is used for correcting sample selection bias.
- We make use of Sato-Vartia index as it allows for a simple multiplicative decomposition of quality effects.
- Our estimated effect of quality difference is about 10%.
- We are currently in the process of estimating the effect of quality differences in services sector on overall Household Consumption PPP.

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