Unveiling rural by-employment patterns and its implications for national income estimates in early phases of Japan's industrialisation

Hi-Stat Workshop on *Historical Occupational Structures: Asian and European Perspectives*

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Introduction

- By-employment

  Farm family by-employment widespread in the latter half of the Tokugawa period.

  The pattern could be inverse-U shaped.

- National income estimates

  When the existence of subsidiary workers is taken into account, to what extent will the existing national income estimates be affected?

Patterns of rural by-employment (1)

- The relationship between by-employment and economic growth

  → Inverse U curve
- Data: matrix tabulations of principal and subsidiary occupations
- Two prefectures: Yamanashi (1879) and Shizuoka(1925)


Yamanashi
Shizuoka

Table 1. Principal-subsidiary occupational matrix: Yamanashi, 1879 (both sexes combined)

	Principal										
	Farming	Food	Constr	Textiles	Metal	Other mfg	Commerce	Service	Public service & professionals	Other	Total
	194,338	779	2,448	18,280	503	4,233	7,833	2,163	3,132	839	234,548
Subsidiary											
Farming	20,258	22	36	9,788	5	38	236	4	11	4	30,402
Food	1,813	10	5	0	3	3	46	9	3	0	1,892
Construction	4,790	1	7	1	0	1	17	0	0	2	4,819
Textiles	9,836	4	0	327	0	415	20	0	1	4	10,607
Metal	268	0	1	0	9	0	4	0	0	1	283
Other mfg	4,046	3	17	38	1	30	43	3	3	1	4,185
Commerce	8,423	62	40	18	12	40	587	53	30	20	9,285
Service	3,099	17	2	11	0	3	50	7	4	1	3,194
Public service & profess	2,084	10	6	3	0	1	16	5	43	2	2,170
Other	70	0	2	2	0	4	8	1	0	1	88
Total	54,687	129	116	10,188	30	535	1,027	82	95	36	66,925

Table 2. Principa-subsidiary occupational matrix: Shizuoka, 1925 (both sexes combined)

	Principal									
	Farming	Fishery	Mining	Mfg	Commerce	Transport	Public service & professionals	Other	Domestic service	Total
	449,305	20,926	1,695	166,351	109,122	24,140	31,016	20,094	7,833	830,967
Subsidiary										
Farming	157,525	4,296	107	9,199	5,355	2,319	1,186	1,192	19	181,198
Fishery	9,250	78	12	233	233	77	7	81	1	9,972
Mining	109	2	3	6	11	4	1	0	0	136
Manufacturing	41,193	286	5	1,628	2,029	112	119	204	6	45,582
Commerce	7,424	249	19	2,338	5,357	424	335	182	1	16,329
Transport	3,802	39	4	62	261	104	6	20	0	4,298
Public service & profess	267	3	0	65	91	11	239	19	0	695
Other	6,625	135	0	187	259	48	19	266	1	7,540
Domestic service	27	0	0	2	9	0	1	0	2	41
Total	226,222	5,088	150	13,720	13,605	3,099	1,913	1,964	30	265,791

Findings from comparison of the tables

1. Weight of primary sector declined: 83% to 57%
2. Specialisation took place in the secondary & tertiary sectors

→ Ratio of subsidiary to principal workers

	Secondary	Tertiary
1879	0.83	1.12
1925	0.27	0.12

3. Decline in supply of subsidiary labour from primary sector to the tertiary sector: 93% to 55%
4. However, the supply to the secondary sector was still large: 95% to 91%

   → Farming had been the main source of the supply of subsidiary labour during this period(1879-1925)

Patterns of rural by-employment (2)

- District-level analysis (Yamanashi: 9 districts; Shizuoka: 13 districts)
- Indicators of development and by-employment:

1. Proportion primary: weight of farming in the district's workforce

2. Proportion of all workers having a subsidiary occupation

3. Proportion of workers having a subsidiary occupation in the primary sector

4. Proportion of workers having a subsidiary occupation in the secondary sector

5. Proportion of workers having a subsidiary occupation in the tertiary sector

Figure 2. By-employment and the proportion primary

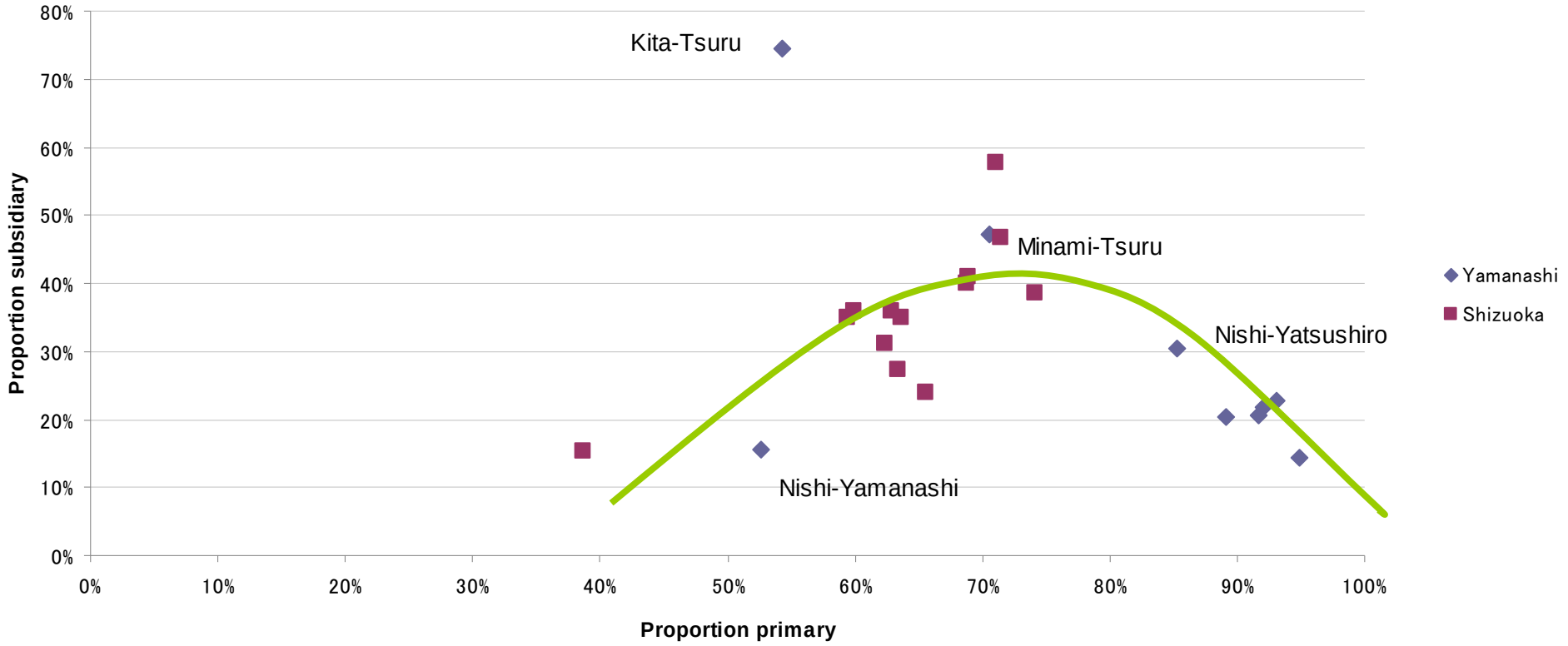


Figure 3. Primary by-employment and the proportion primary

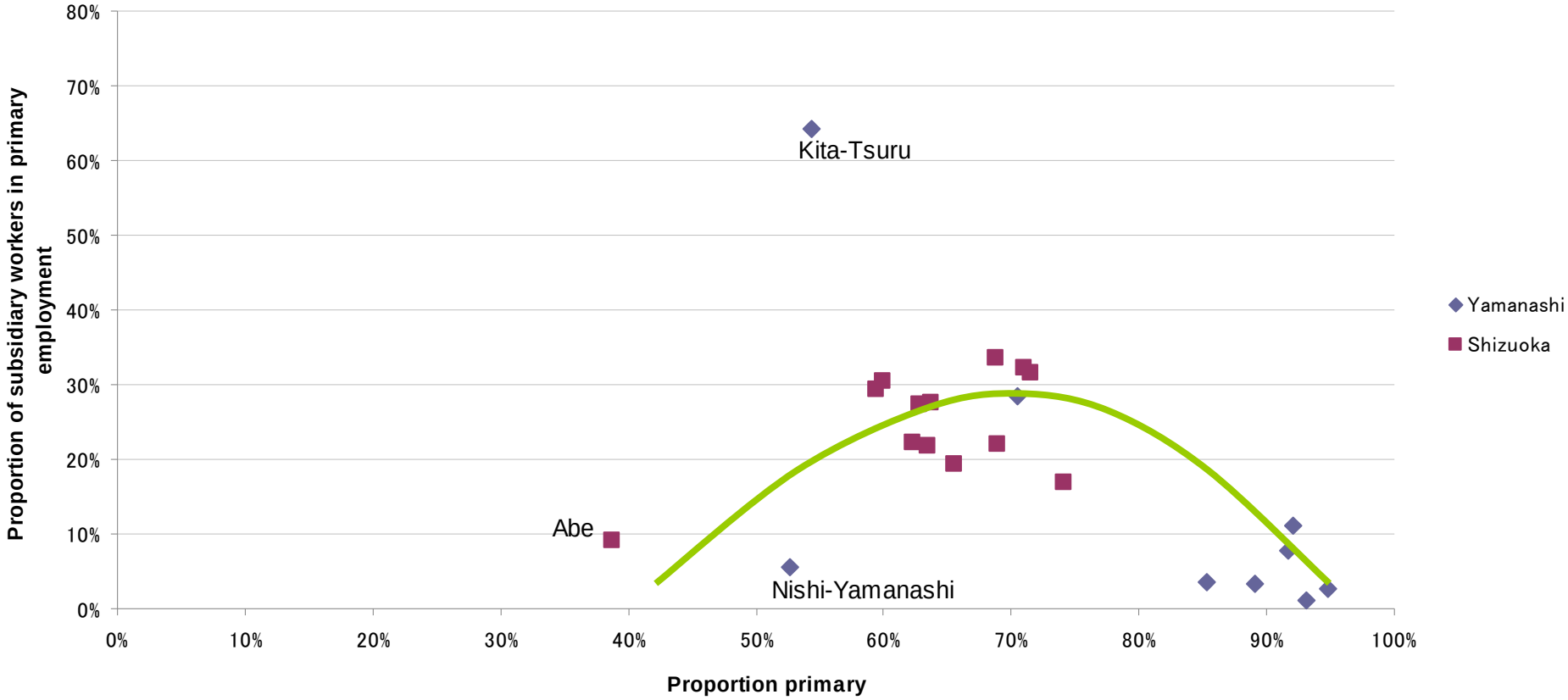


Figure 4. Secondary by-employment and the proportion primary

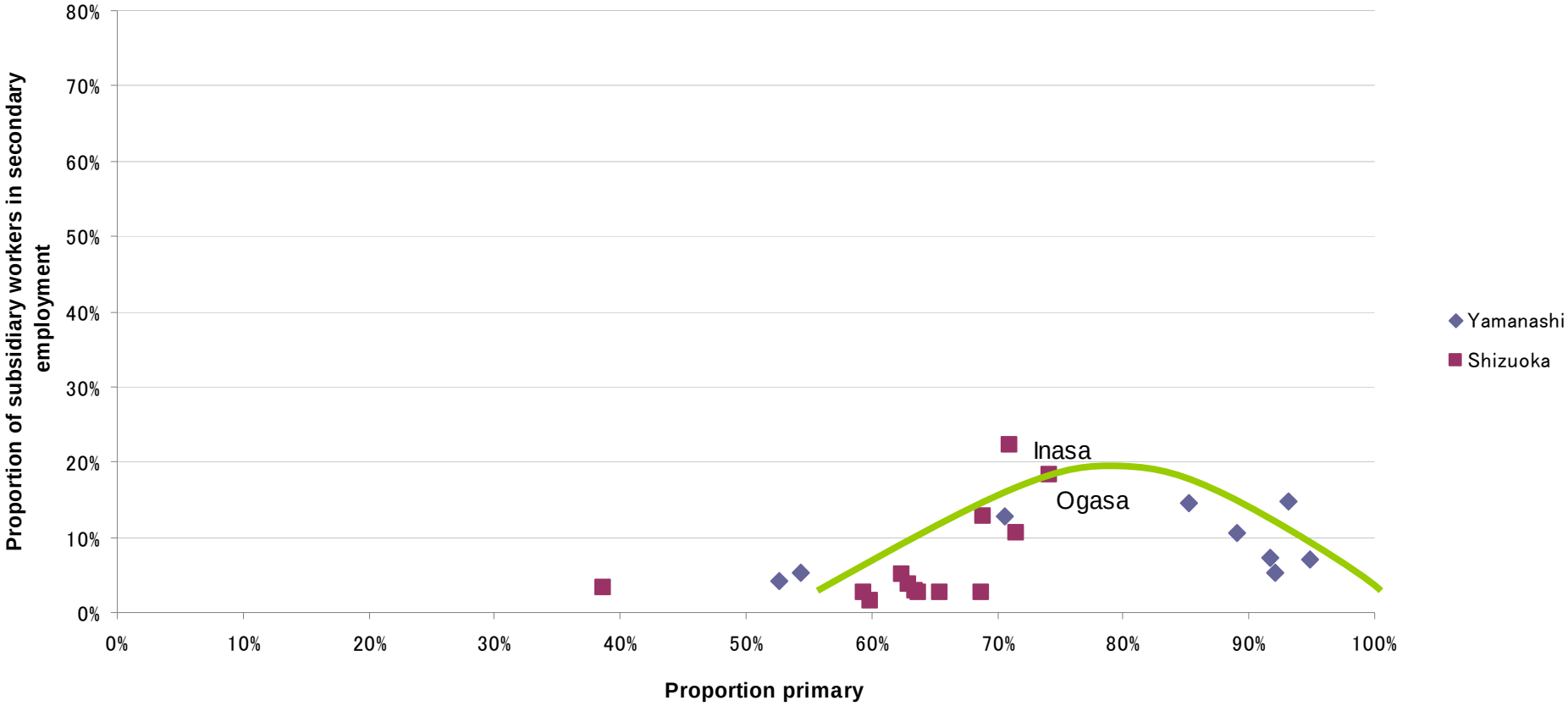
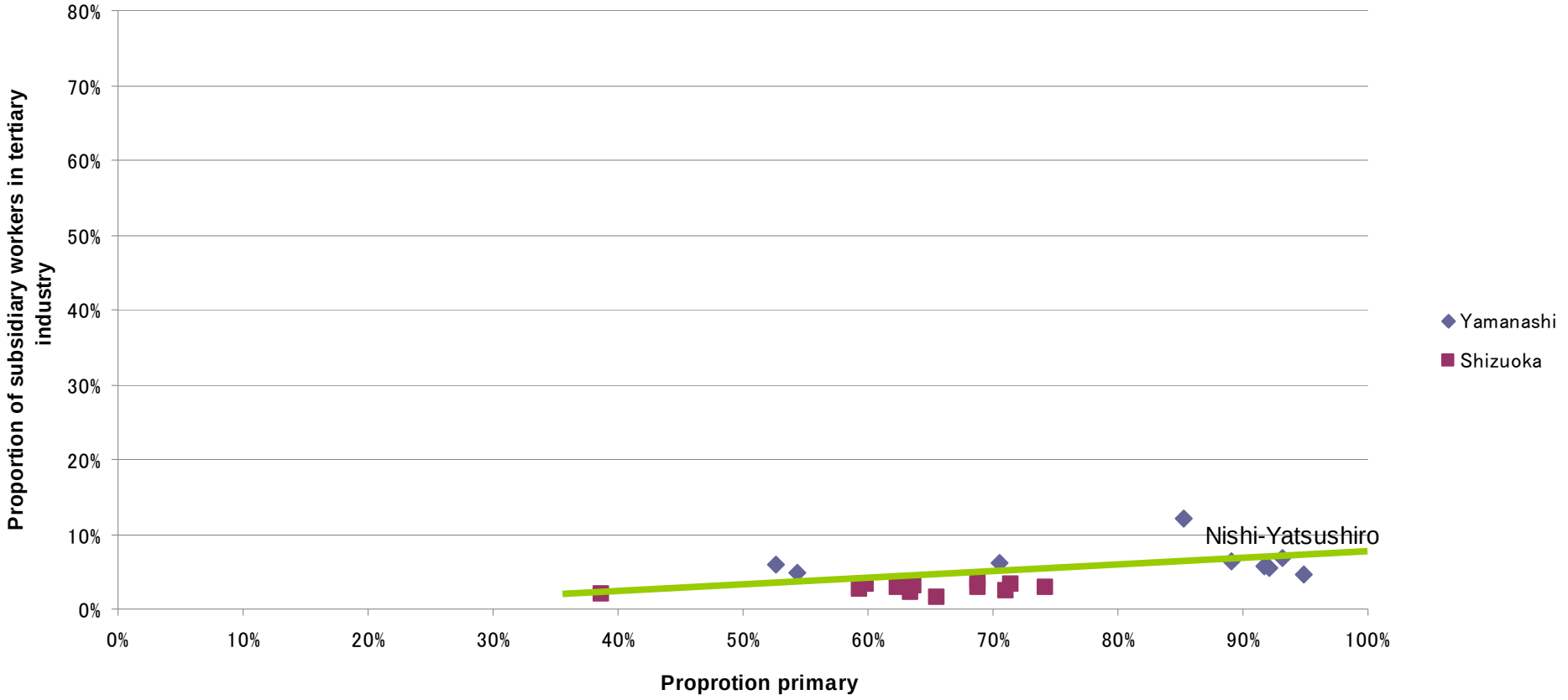


Figure 5. Tertiary by-employment and the proportion primary



The tertiary sector in the national economy, 1885-1940

- Ohkawa et al. [1967-1988]

  Long-term Economic Statistics of Japan (LTES)

  → Income approach (Tertiary industry)

- NDP at factor price on tertiary industry

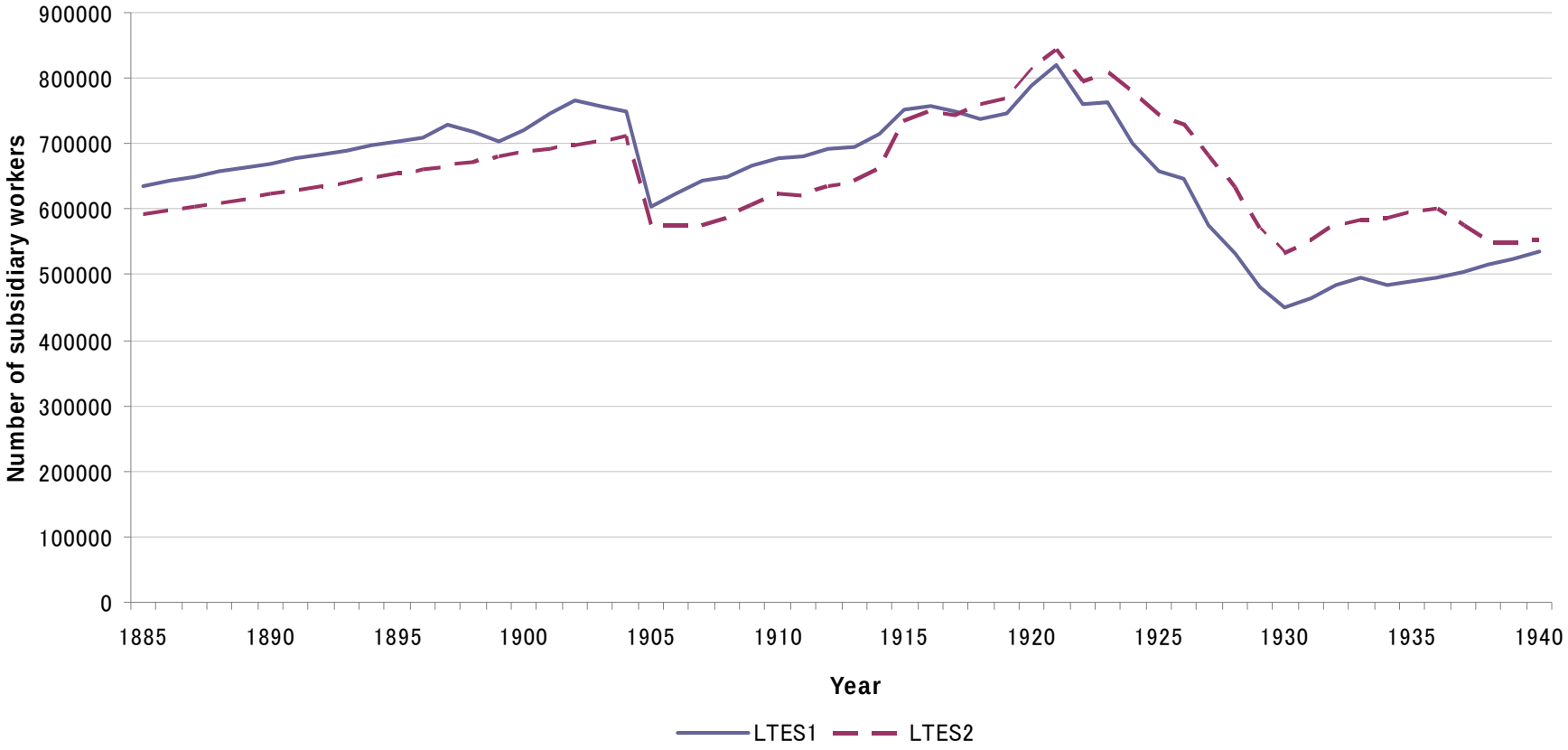
  = The number of occupied workers in this sector ✕ average income of this sector

- The number of subsidiary workers in commerce & services sector

  = Multiplying the following subsidiary-to-principal ratios to the number of principal workers in this sector

1885-1904	0.3
1905-1920	0.24
1921-1929	Linear interpolation between 1920 and 1930
1930-1940	0.108

Figure 1. LTES estimates of subsidiary workers in tertiary employment



Regression Analysis

Tertiary (commerce, services, transport and communication) by-employment

$= \alpha + \beta_1$ Population Primary

$+ \beta_2$ Population density

Figure 6. Tertiary by-employment (intra-sectoral cases excluded) and the proportion primary

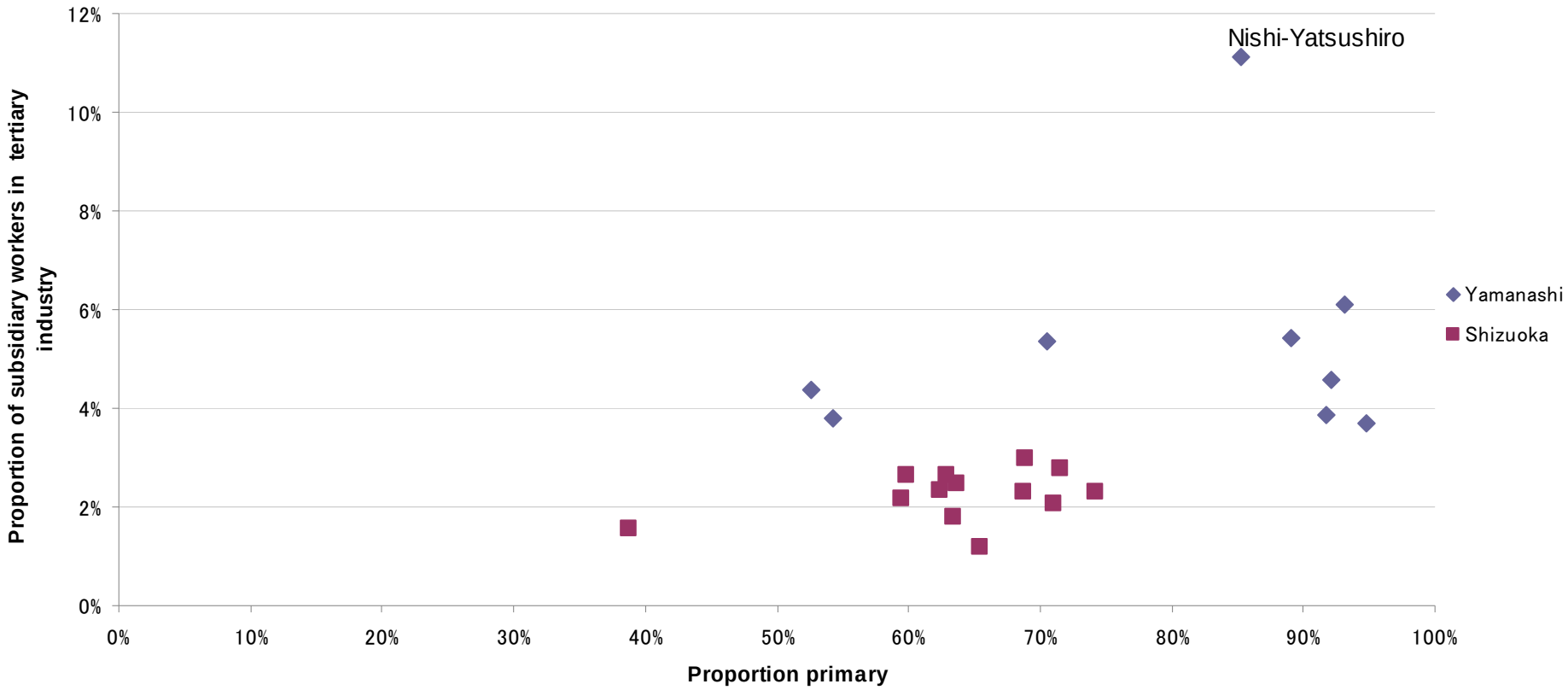


Figure 7. Tertiary by-employment (intra-sectoral cases excluded) and population density

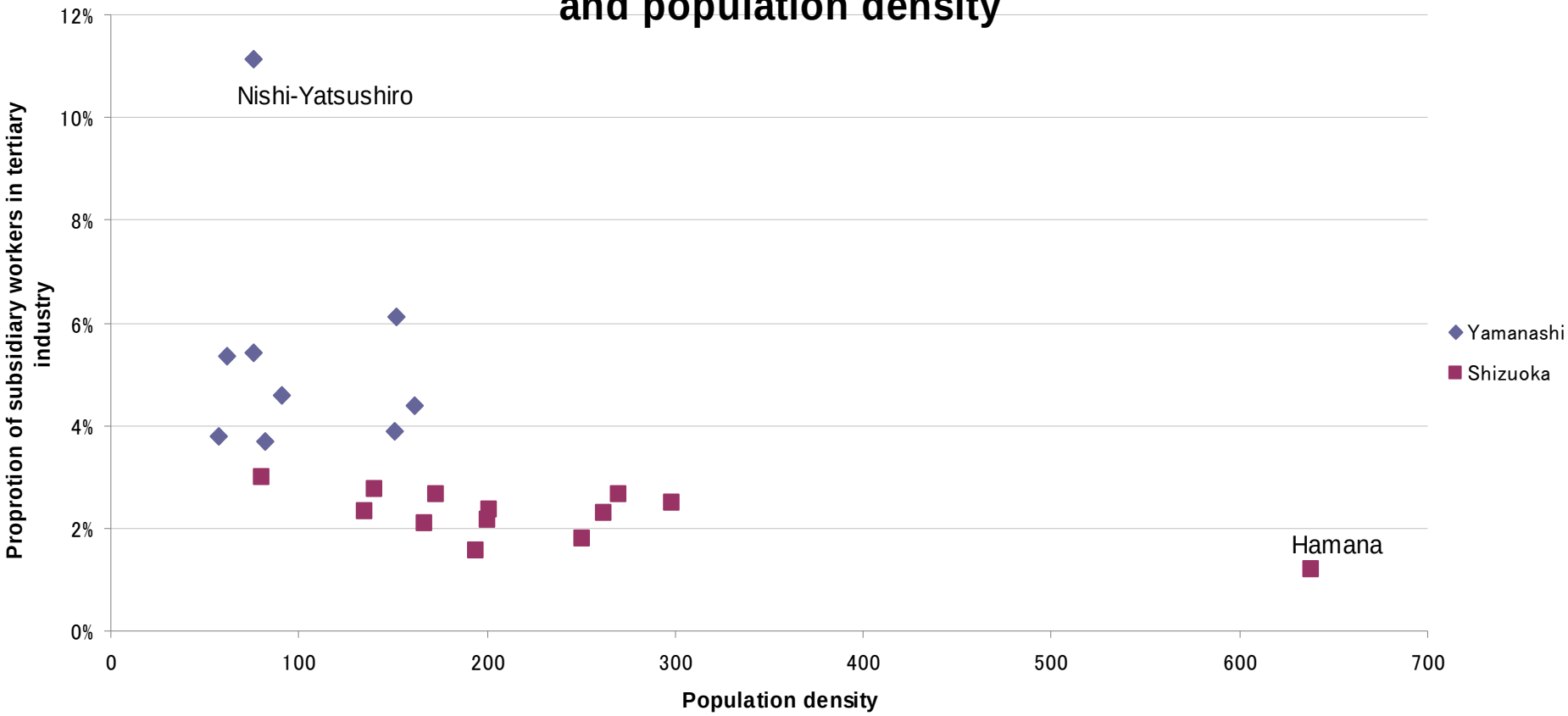


Table 3. Regression results: Yamanashi and Shizuoka districts pooled

Dependent variable: Ratio of subsidiary workers in commerce, services and transport to principal workers in sectors other than in the above categories	
Explanatory variables:	
Population dencity	−0.002305
	(3.64)**
% primary	1.508594
	(2.84) *
Intercept	−4.096903
	(9.58)**
N	22
R^2 (adjusted)	0.57

1) % primary is defined as of the gainfully occupied
2) t value in parentheses
3) Significance level: * 5%, ** 1%

Figure 8. Estimates of subsidiary workers in tertiary employment, 1885-1940

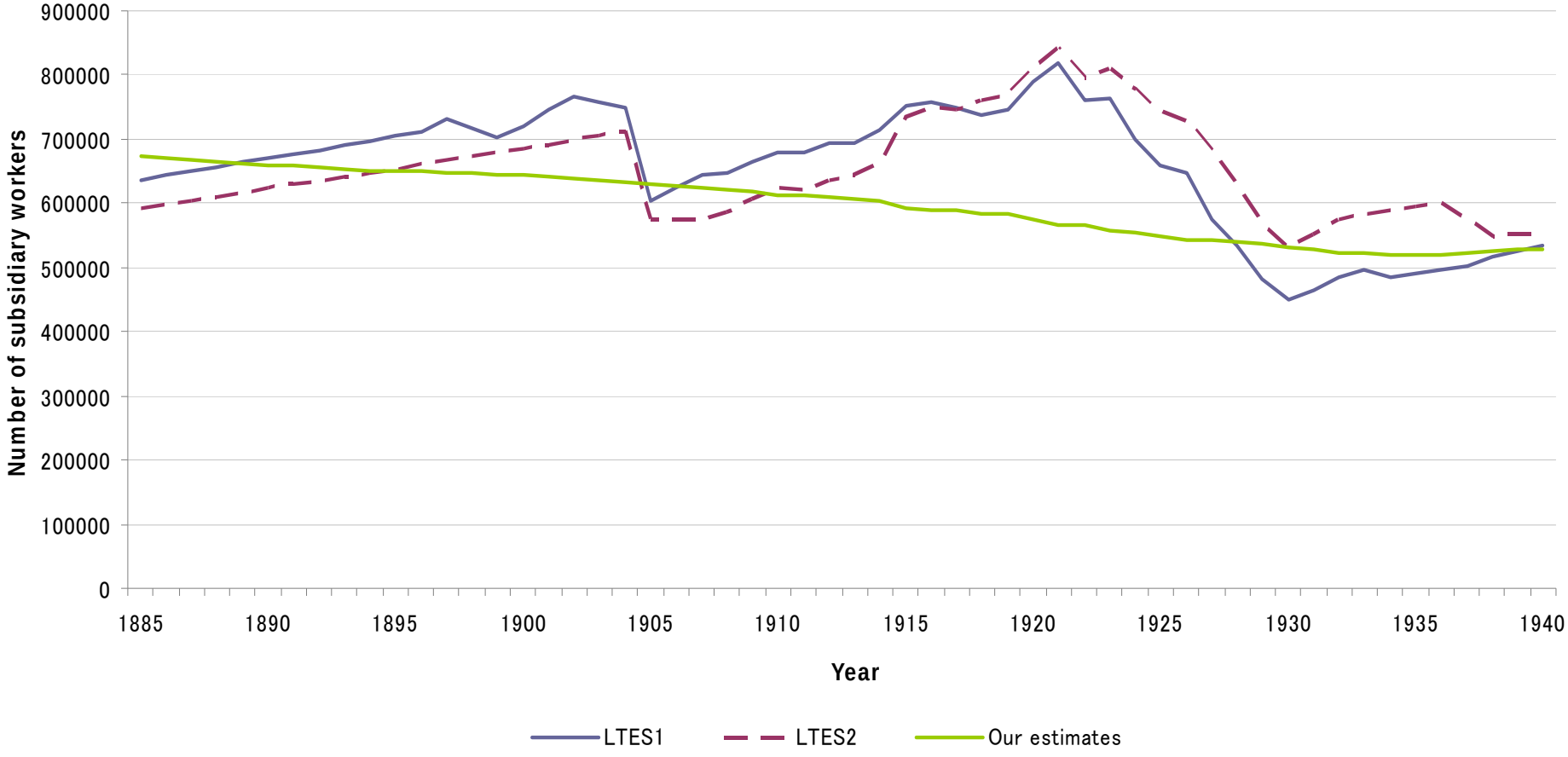


Table 4 Estimated numbers of subsidiary workers in commerce, services and transport: LTES and our estimates compared

	(1) LTES1	(2) LTES2	(3) Our estimates	(4) ((3)−(1))/(1)	(5) ((3)−(2))/(2)
1885	636,300	591,300	674,129	6%	14%
1890	669,900	622,800	659,219	−2%	6%
1900	721,200	685,800	643,459	−11%	−6%
1910	678,240	624,480	613,989	−9%	−2%
1920	789,360	811,200	573,654	−27%	−29%
1930	448,632	532,440	532,378	19%	0%
1940	535,248	551,880	527,201	−2%	−4%

1) LTES 1 denotes estimates reported in LTES 1 and LTES 2 is estimates that should have been if based on Umemura's revised estimates in LTES 2.
2) Transport (inc. communication) is not included in LTES1 & LTES2.

Table 6. Estimated values of NDP in commerce, services and transport (Millions of yen)

	(1) LTES1	(2) Our estimate	(3) ((2)−(1))/(1)
1885	226	228	1%
1890	276	276	0%
1900	625	619	−1%
1910	926	919	−1%
1920	3,590	3,516	−2%
1930	3,593	3,622	1%
1940	6,870	6,866	0%

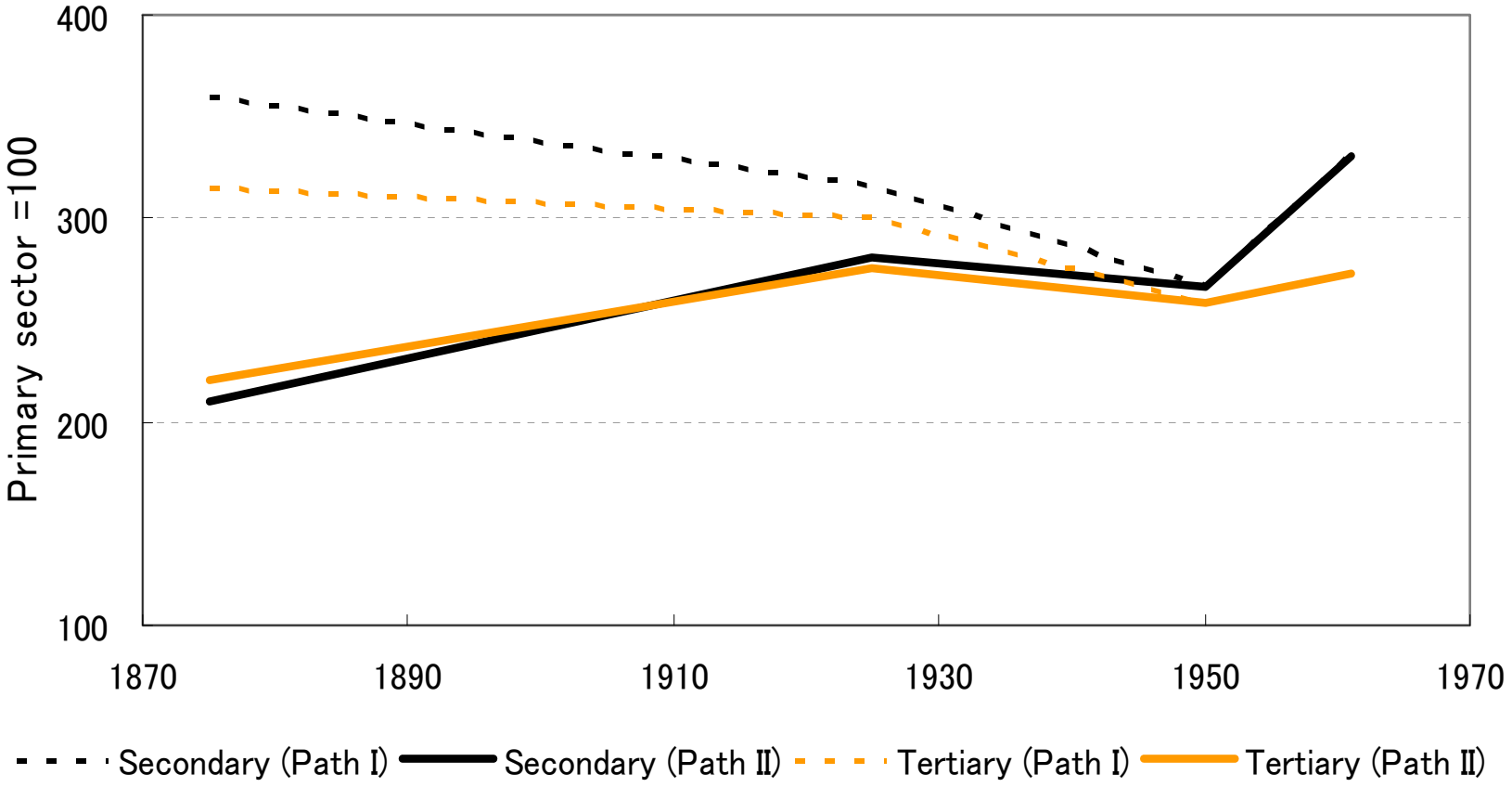
Implications

1. By-employment and national income estimates
2. For regional income estimates: the regression equation as an estimation tool
3. The evolution of rural by-employment and early modern growth or proto-industrialisation
4. By-employment and sectoral differentials in labour productivity

Two hypothetical paths of change in sectoral labour productivity differentials:

1872/80, 1925, 1950 and 1960/2

(based on Kuznets, *Modern Economic Growth*)



Assumptions

1870s

Primary	L(P)0.82+0.5*(L(P)*0.18+(L(S)*0.38+L(T)*0.02)
Secondary	L(S)*0.61+0.5*(L(S)*0.39+L(P)*0.11+L(T)*0.01)
Tertiary	L(T)*0.97+0.5*(L(T)*0.03+L(P)*0.07+L(S)*0.01)

1925

Primary	L(P)*0.9+0.5*(L(P)*0.1)
Secondary	L(S)+0.5*(L(P)*0.0667)
Tertiary	L(T)+0.5*(L(P)*0.0333)