

The transformation of the organic energy system: the Swedish perspective

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Main arguments

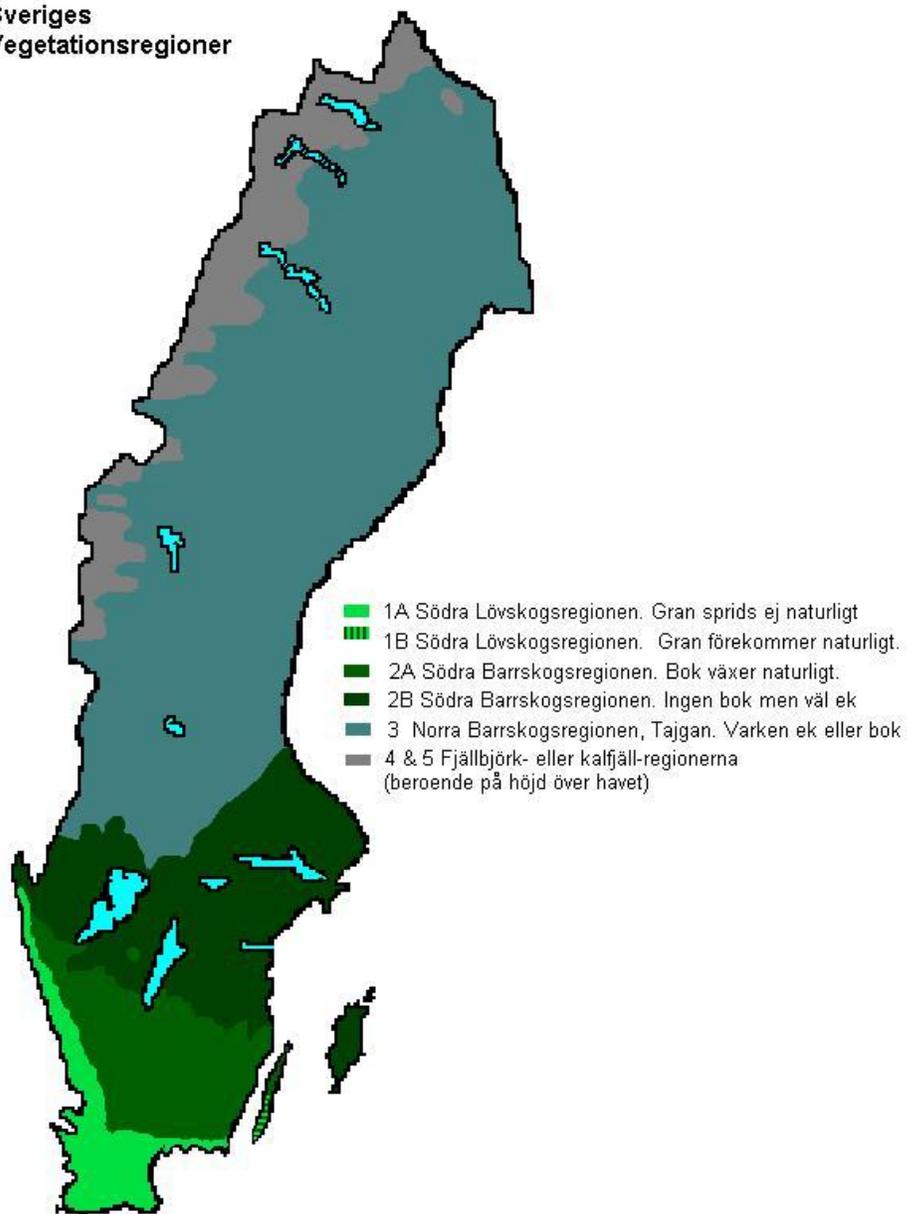
The organic energy system posed limits to accessibility of organic resources

The full potential of organic resources only became available with the industrialization and the mineral energy system

Coal in Sweden was very closely linked to mechanisation by steam engines

There is a dynamic between the organic and mineral energy system where both reinforces each other

Sveriges
Vegetationsregioner



Källa: Bonniers Lexikon "Äpplet", band 13, artikel "Sverige", spalt 1047

Sweden from a natural resource point of view

Carl von Linné: The wish to colonize inland Norrland 1732



First attempts on steam



The Dannemora Newcomen "fire and air machine" of 1728



Sweden on steam

- 1804 Samuel Owen
 - Engineering industries
 - Diffusion and formation of human capital,
 - Values; temperance
- Railways
 - New organization, new state, new machines
- Institutional embeddning of coal
- Demand for coal was derived from demand for steam engines



The Witch of Stockholm 1816

Firewood and coal: not close substitutes

- The boiler capacity is affected by;
 - Rate at which fuel can be burned
 - At a given combustion area the fuels energy per volume is important
 - Most obvious with steam locomotives

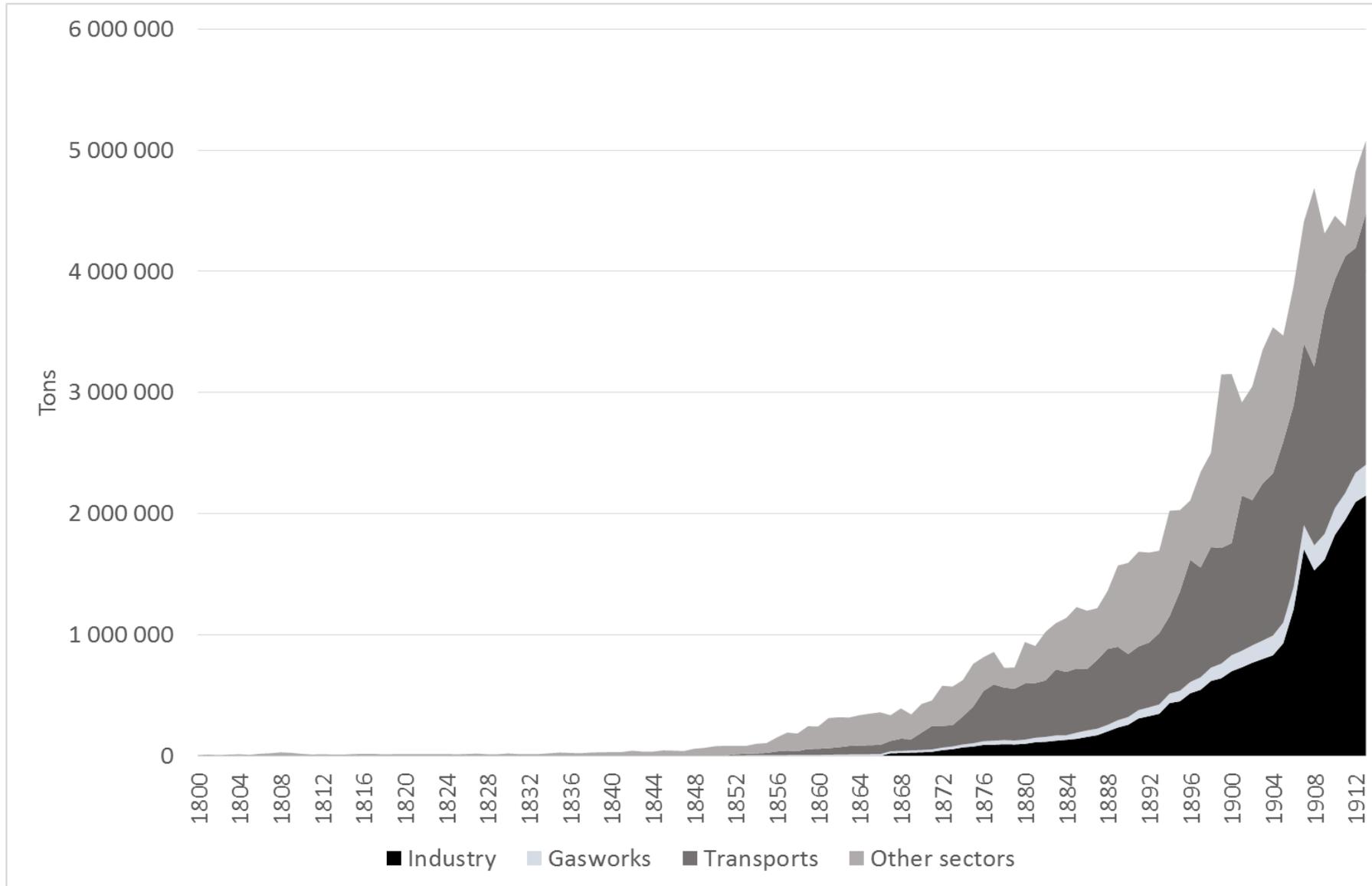


The Steam locomotive example

- SJ Litt B (1909)
- 100 - 120 kg coal for boiling 1 kbm water to 1.2 bar pressure and 187 degrees C
- Steam engine steam generating capacity is 9 tons of steam/hour
- One ton of coal per hour
- Fender capacity 6 tons of coal corresponding to 35 kbm of wood



Fig 1. Swedish coal imports after sector of destination 1800-1913. Tons



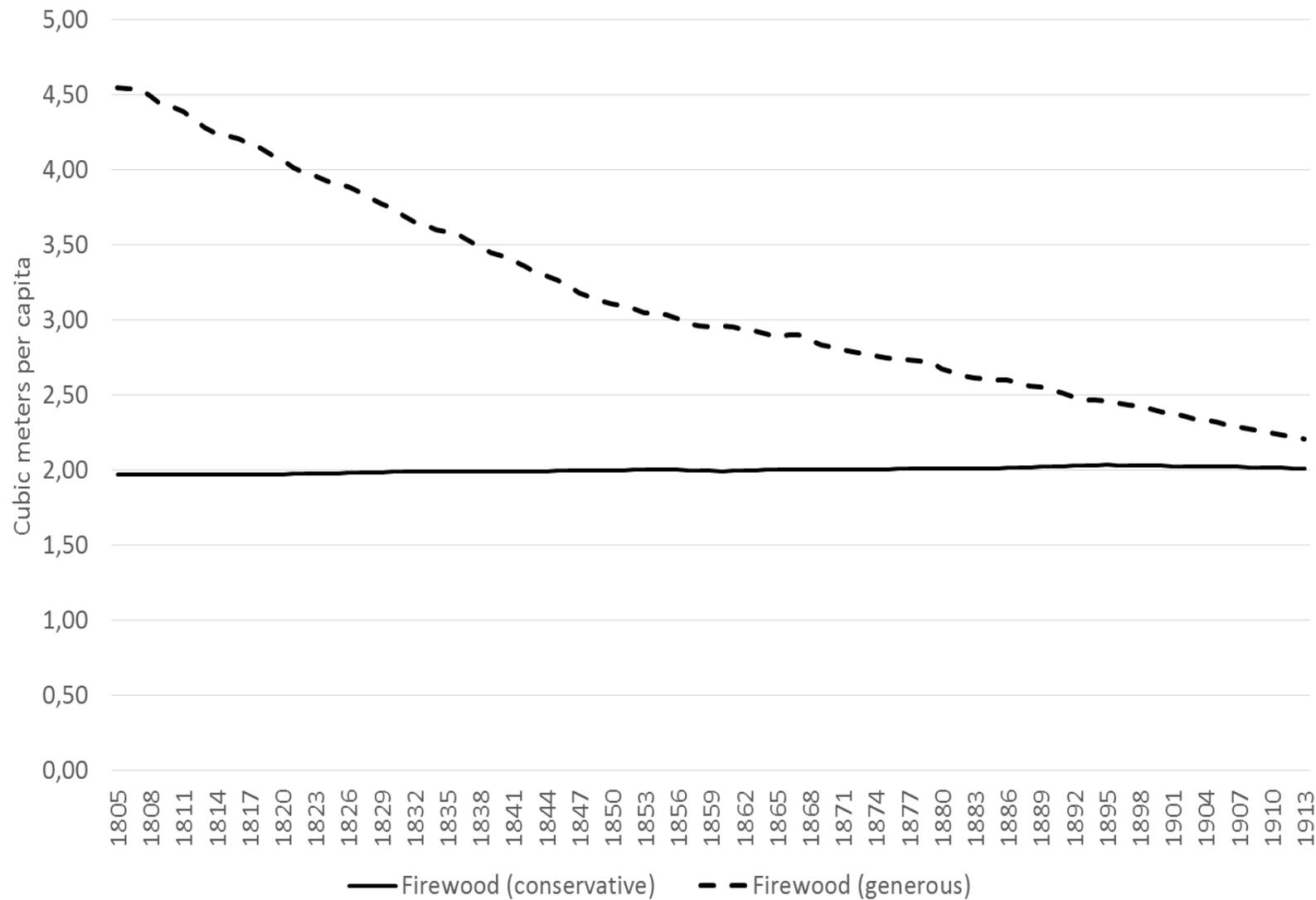
Firewood in the domestic sector



- Very few sources: main issue did the per capita consumption decrease, and did that release energy resources to other uses?



Fig 2. Domestic firewood consumption per capita 1805-1913. The possible scenarios.





Swedish wood consumption:

Conservative guess:

1840: around 12 mill kbm
1890: around 30 mill kbm

Generous guess:

1840: around 16 mill kbm
1890: around 33 mill kbm

}
No big deal

If NO fall in per capita consumption happened we get an approximation of the tile stove effect:

1890: around 55 mill kbm (as compared to today 70 mill kbm)

Is that likely?

The north is intergated in the market

- Northern Sweden becomes intergated in the market
 - The timber frontier
 - A higher demand for sawn products leads to colonization of inland norrland, made possible by networks of food distribution established by the forest comapnies
 - Wage incomes important
- The iron industry turns to coke
 - Happens only after 1905

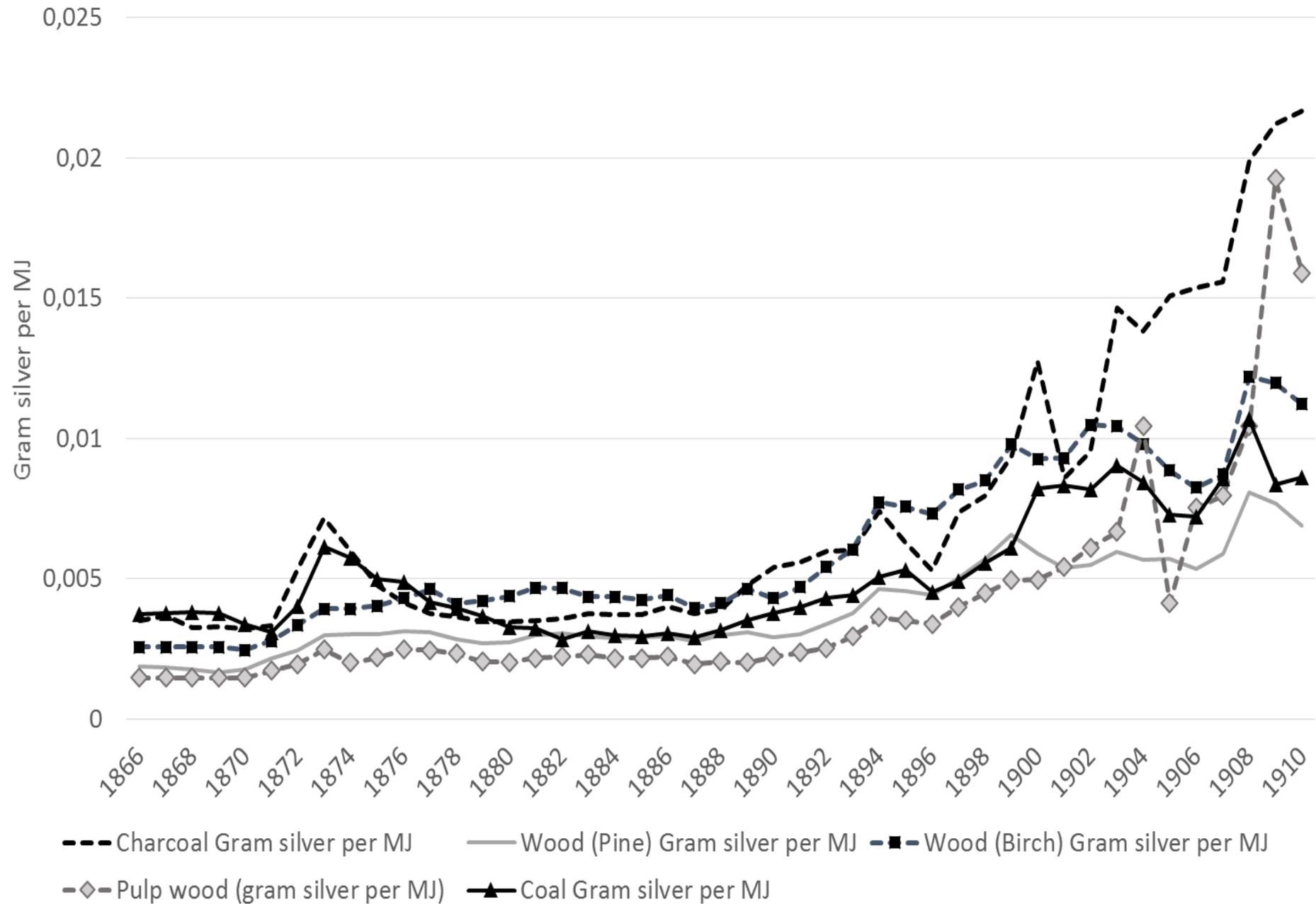


Sawmill labourers in Sundsvall (around 1900)



Sawmill fortunes materilizing in Stockholm

Fig 3. Prices for different fuels and wood. Sweden 1866-1910. Grams of silver per MJ.



Conclusions

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